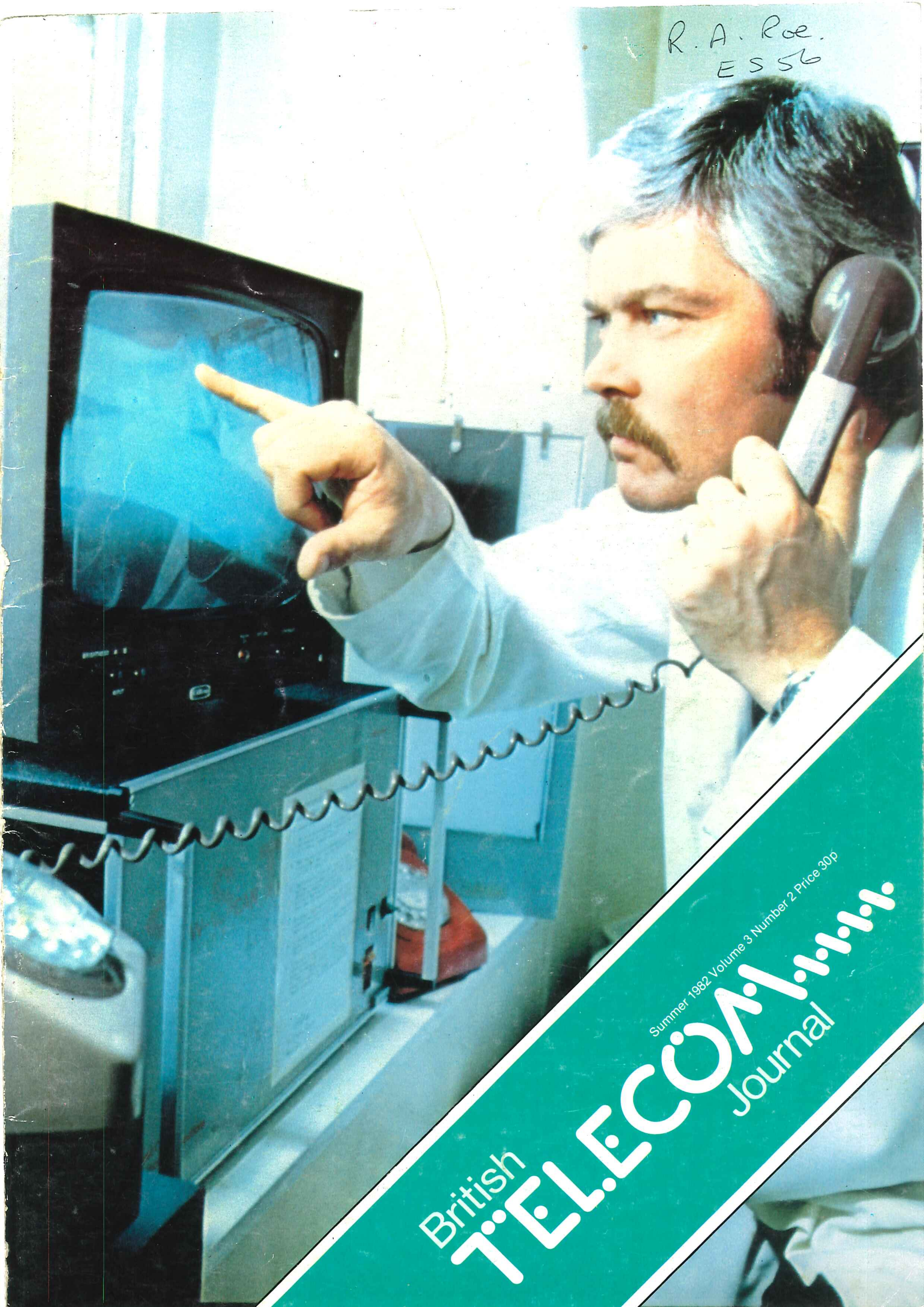
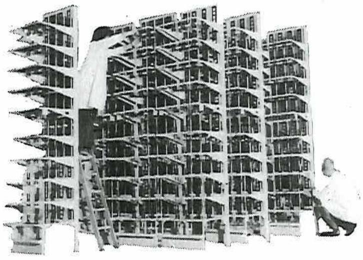
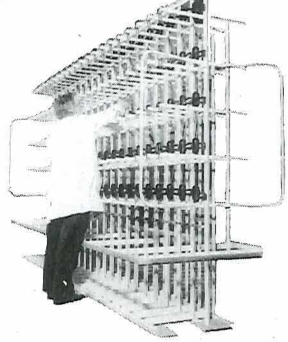
R. A. Roe.
ES56

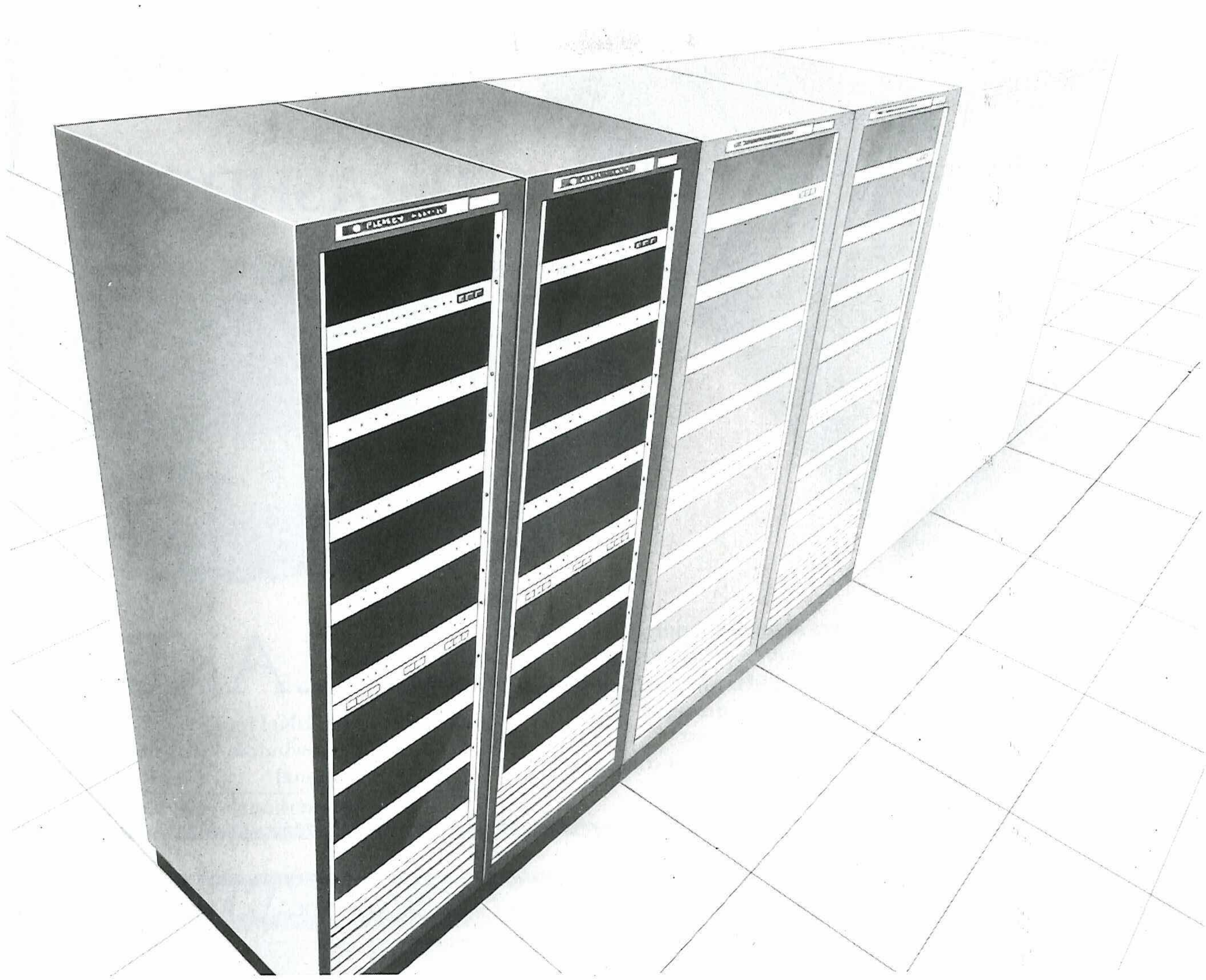


British
TELECOM Journal

Summer 1982 Volume 3 Number 2 Price 30p







DRE+NEWBURY= THE PERIPHERALS FUTURE.

Data Recording Equipment and Newbury Laboratories have merged to form Newbury Data Recording Limited.

The combined industry experience of the two former companies enables Newbury Data to offer you several important benefits.

The first of which is a comprehensive range of printers, VDUs, disk drives, media and supplies from a single source.

Technical support for end users and OEMs is available throughout the UK. Plus OEM support based in France and Germany.

Six service workshops spread thoughout Britain will enable fast, efficient service engineering and maintenance.

Printers, VDUs and disk drives will be manufactured at the DRI Group's three factories in Staines, Winsford and Newbury.

And customers will have access to three separate development groups producing printers, VDUs and disk products.

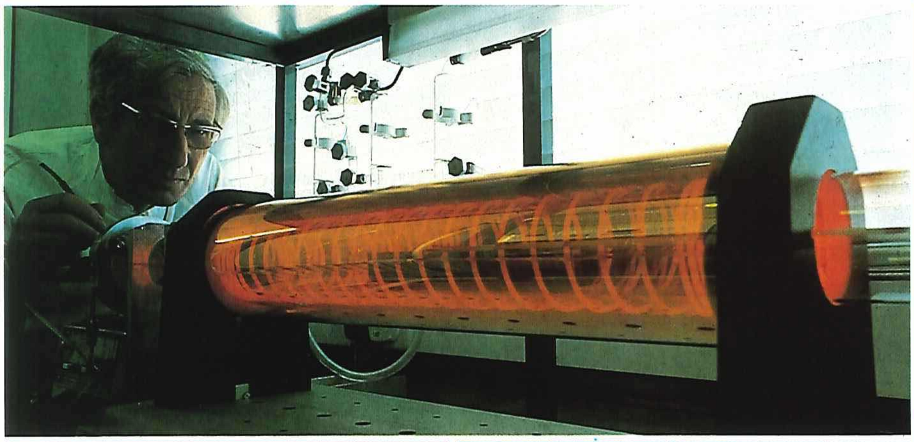
In addition, our on-going indigenous research and development commitment will ensure that we provide you with both a dynamic performance growth potential and innovative design for your future system requirements.

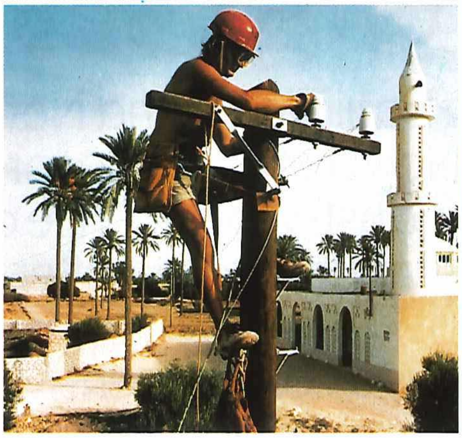
So remember the name, Newbury Data: the peripherals company to look to in future.

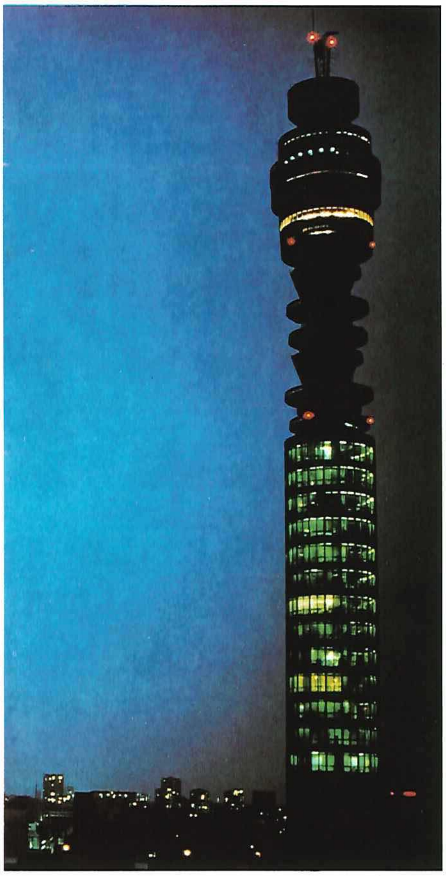
Newbury Data

A member of the DRI Group.

PHONE FOR FULL INFORMATION. NEWBURY DATA RECORDING LIMITED, BIRMINGHAM (021) 707 7170, CAMBRIDGE (02205) 5357/8, EDINBURGH (031) 554 0051, STAINES, MIDDX (0784) 50161/2, MANCHESTER (061) 491 0134, OEM & EXPORT SALES (0784) 61141.







WE ONLY SELL EXPERIENCE

British Telecom is one of the largest and most innovative telecommunications organisations in the world, and is currently spending £2,000 million a year on the most massive modernisation programme ever undertaken.

British Telecom operates one of the world's most comprehensive fibre-optics networks and is implementing a nationwide integrated digital switching system which will combine voice, data, telex, facsimile and video services.

Prestel, British Telecom's viewdata system, is the first interactive (two-way communication) visual information system in the world.

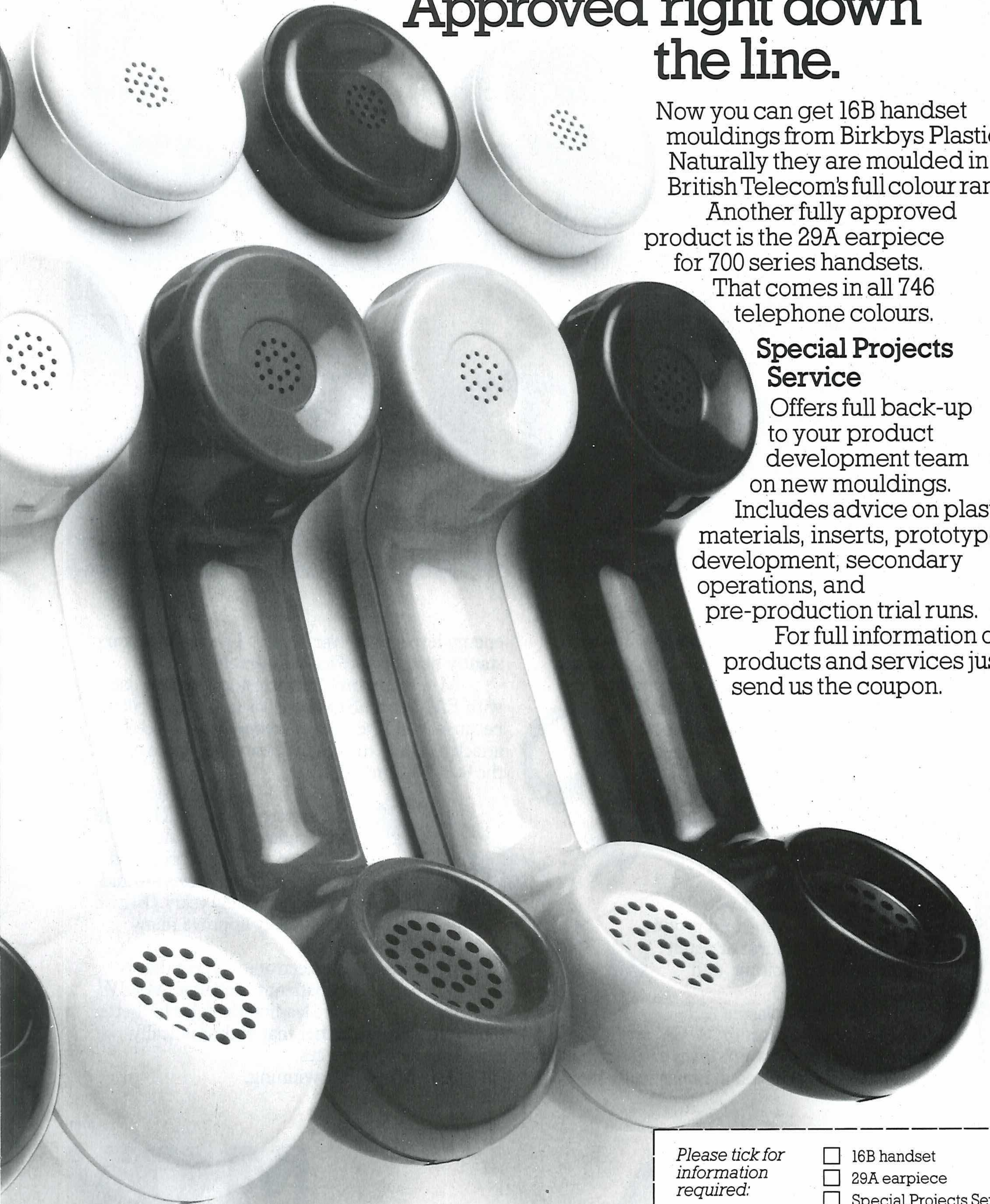
British Telconsult is the consultancy arm of British Telecom, with access to all British Telecom's accumulated technology and expertise: its data banks, computer models and design facilities. It is in a unique position to advise on the most advanced techniques in telecommunications – and this advice is completely impartial because British Telconsult manufactures nothing, and has nothing to sell except experience.

Whether you are interested in developing new networks, or updating existing ones, or integrating the old with the new, our consultants can take a cool, unbiased look at the problem – as they have already done in over 40 different countries.

For information, please contact us at 55 Old Broad Street, London EC2M 1RX. The telephone number is 01-588 3013 (if calling from outside the UK: +441 588 3013). Telex 887523.

British
TELCONSULT
The consultancy service of British Telecom

Birkbys Plastics. Approved right down the line.



Now you can get 16B handset mouldings from Birkbys Plastics. Naturally they are moulded in British Telecom's full colour range.

Another fully approved product is the 29A earpiece for 700 series handsets. That comes in all 746 telephone colours.

Special Projects Service

Offers full back-up to your product development team on new mouldings.

Includes advice on plastics materials, inserts, prototype development, secondary operations, and pre-production trial runs.

For full information on products and services just send us the coupon.

Please tick for information required:

- ☐ 16B handset
- ☐ 29A earpiece
- ☐ Special Projects Service

Name

Position

Organisation

Address

Post to: Birkbys Plastics Limited, PO Box 2, Liversedge West Yorkshire, United Kingdom WF15 6QA.

Birkbys Plastics

a member of the **PLESSEY GROUP**

Birkbys Plastics Limited, PO Box 2, Liversedge, West Yorkshire, United Kingdom WF15 6QA.
Telephone: Heckmondwike (0924) 403721 Telex: 55332

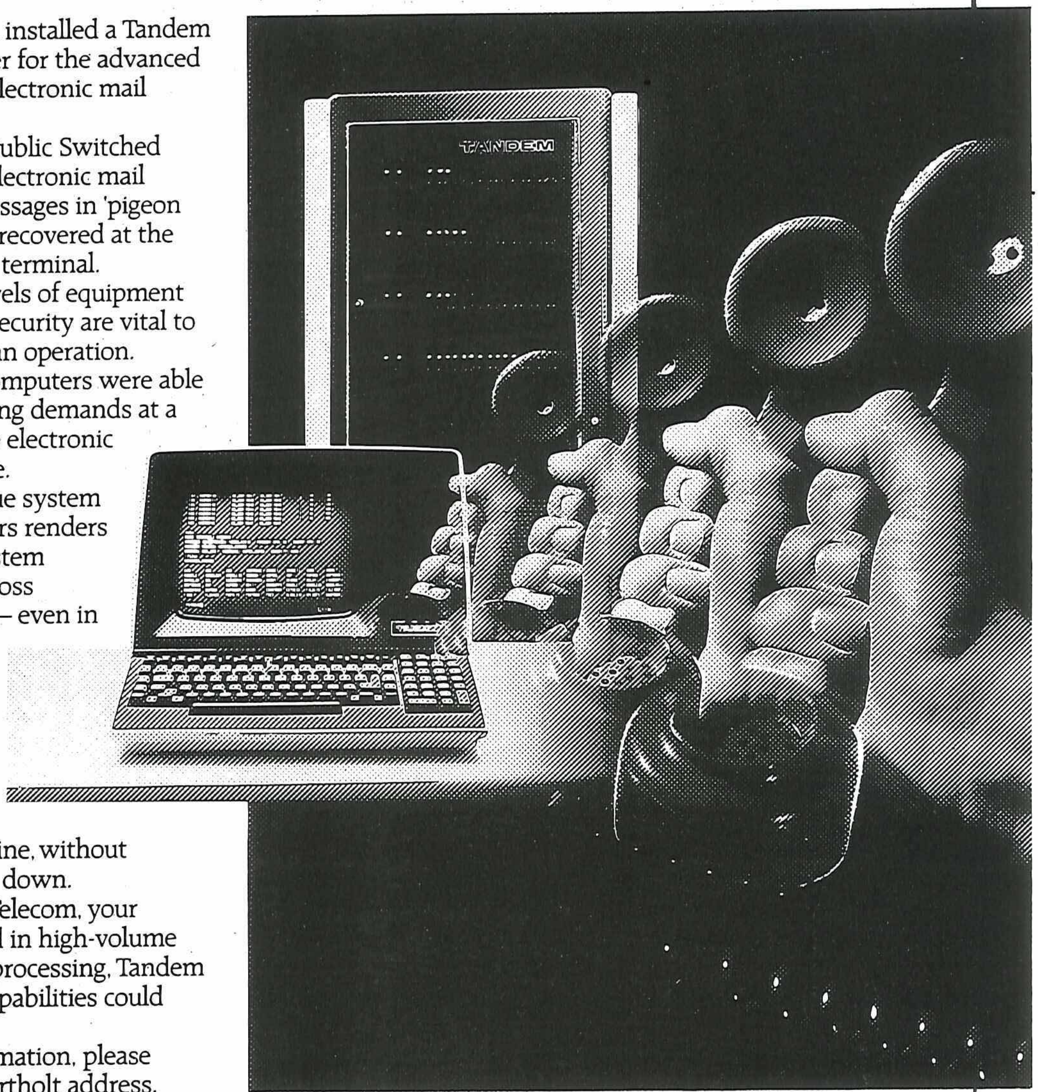
R&P 049

"At British Telecom, our PSS-mail service will demand round-the-clock reliability." Tandem(TM) delivers it.

British Telecom installed a Tandem NonStop(TM) computer for the advanced trials of a potential electronic mail service.

Linked to the Public Switched Data Network, the electronic mail service will store messages in 'pigeon holes' until they are recovered at the recipient's computer terminal.

The highest levels of equipment reliability and data security are vital to the success of such an operation. Tandem NonStop computers were able to meet these exacting demands at a price that makes the electronic mail concept feasible.



Tandem's unique system of multiple processors renders the possibility of system breakdown or data loss virtually impossible – even in the event of a component failure.

Unlike other systems, normal maintenance and repair can be carried out while the computer is on line, without bringing the system down.

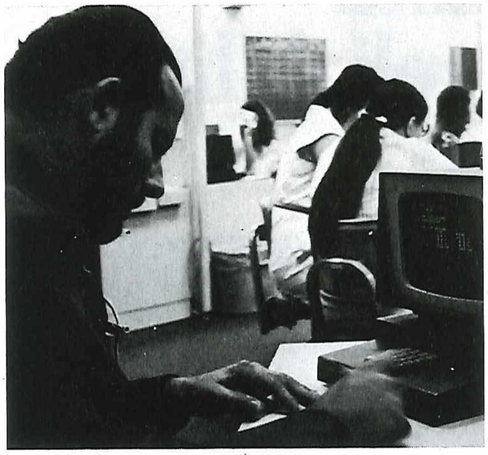
If, like British Telecom, your company is involved in high-volume on-line transaction processing, Tandem NonStop's unique capabilities could prove irresistible.

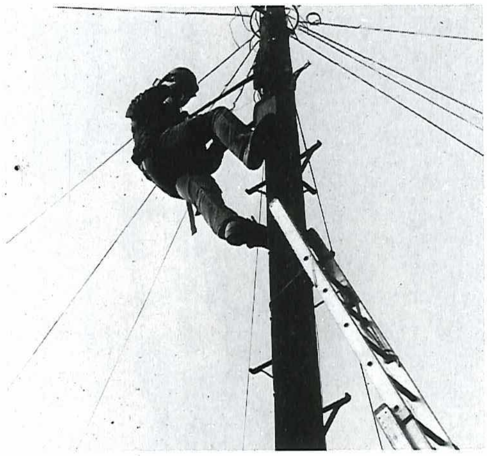
For more information, please contact us at our Northolt address.

TANDEM

Tandem Computers Ltd, Peel House, 32-34 Church Road, Northolt, UB5 5AB Tel: 01-841-7381 Telex: 933333
Also at Bilbao House, 36/38 New Broad Street, London EC2 and 54 Hagley Road, Edgbaston, Birmingham
Tandem and NonStop are trademarks of Tandem Computers Inc.

HOW EUROPEAN PTT's AND PHONE COMPANIES WILL FIND FAULTS BEFORE THEIR CUSTOMERS DO





With the latest automatic testing technology for subscriber lines – the **Series III 4TEL System.**

4TEL automatically tests every line every night: and provides powerful diagnostic testing for fault finding, every day.

The Series III 4TEL System includes:

- Advanced system refinements based on many years of user experience.
- The latest technology in microprocessors and communications.
- New testing features designed for the needs of European PTT's.
- Testing from the field with computer generated voice response.

Fast Measurements

Using distributed microcomputer control, 4TEL measures at unrivalled speed and accuracy – 600 measurements a minute. In a service area with 100,000 subscribers, that means more than 2.5 million measurements in six hours.

Right First Time

In the daytime, 4TEL's line testing and line diagnostic capabilities allow faults to be distributed to the right faultsman first time. On each line test 4TEL is able to distinguish the nature and severity of the fault. 4TEL's powerful fault location capabilities then lead him quickly to the vicinity of the fault – capabilities made possible by eight years of hardware and software development.

Savings

Substantial savings can be made by achieving accurate fault distribution, avoiding costly cable repairs by early fault detection and preventive maintenance and the elimination of wasteful pair changeovers when faults cannot be found by conventional methods.

Centralised Testing

Installing 4 TEL means that the entire Repair Service Control operation can be centralised and effective in controlling field personnel.

Accurate test information is displayed on a screen or printer in the RSC in plain language so that it can be acted on immediately. A faultsman can not only be directed to the fault, but he can verify the repair while he's still on the scene.

4TEL immediately permits major improvements in quality of service through more efficient responsive and preventive maintenance.

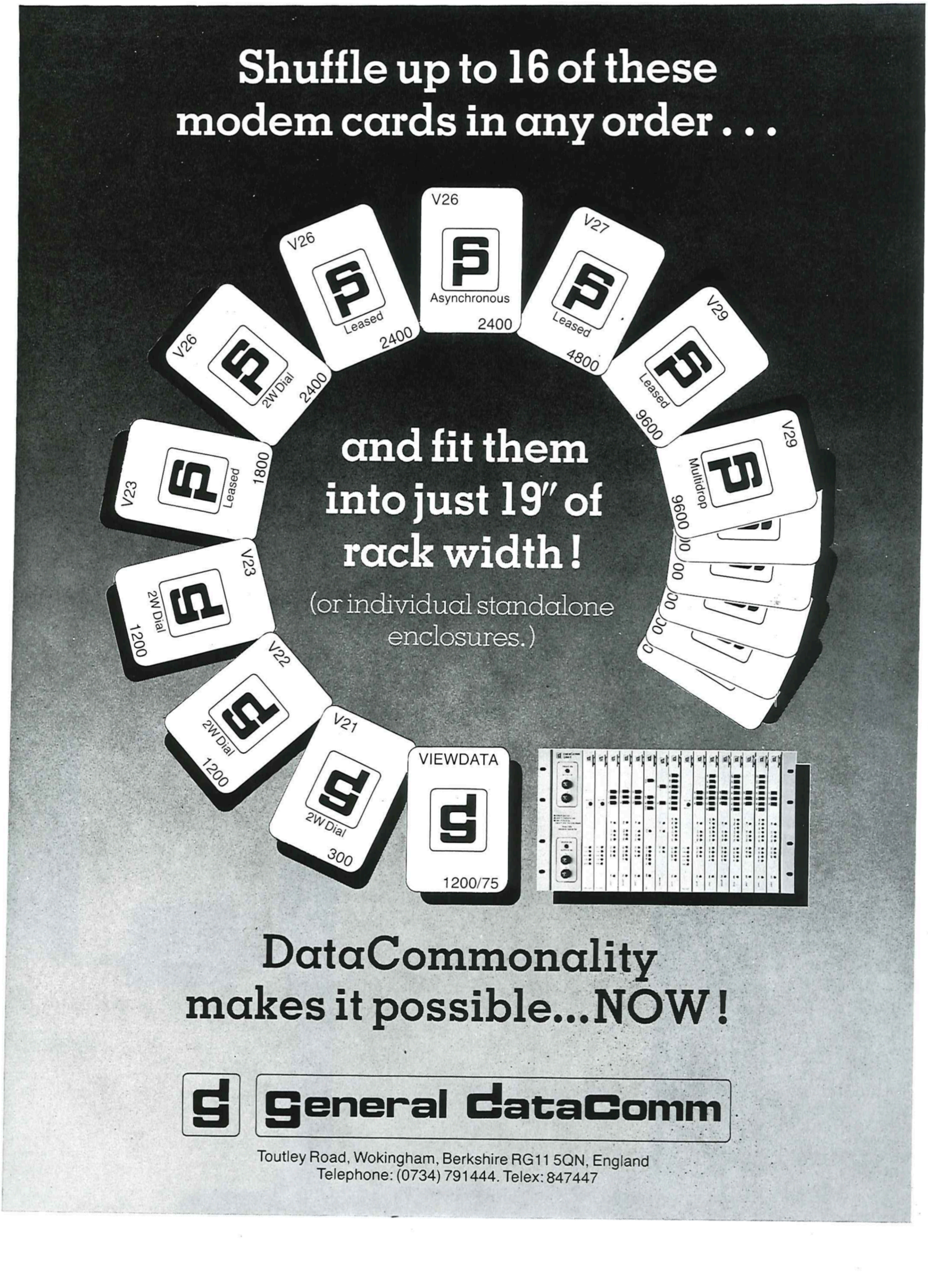
4TEL from Teradyne, one of the world's leading manufacturers of computer controlled test equipment, has been field proven in rural and urban environments and is testing millions of lines now.

For full data write or call:

TERADYNE

Teradyne Ltd.,
Clive House, Queens Road, Weybridge,
Surrey, England. Tel: 0932 51431.

4TEL: THE WORLD's FASTEST AND MOST ACCURATE AUTOMATED SUBSCRIBER LINE TEST SYSTEM.


Shuffle up to 16 of these modem cards in any order . . .
V26 Asynchronous 2400
V27 Leased 4800
V29 Leased 9600
V29 Multidrop 9600
V26 Leased 2400
V26 2W Dial 2400
V23 Leased 1800
V23 2W Dial 1200
V22 2W Dial 1200
V21 2W Dial 300
VIEWDATA 1200/75
and fit them into just 19″ of rack width !
(or individual standalone enclosures.)
DataCommonality makes it possible...NOW !
General DataComm
Toutley Road, Wokingham, Berkshire RG11 5QN, England
Telephone: (0734) 791444. Telex: 847447

SUPERSWITCH
SX-20
SUPERSWITCH
SUPERSWITCH
10
SX5

British Telecom Journal
Summer 1982 Volume 3 Number 2

Published by British Telecom to promote and extend knowledge of the operation and management of telecommunications.

Cover: British Telecom's slow-scan television system – pictures sent in digital form over the telephone network – is helping medical diagnosis in remote areas where travel is difficult. Here, Mr David Bracey, consultant orthopaedic surgeon at the Royal Cornwall Hospital, Truro, uses the screen to study an X-ray of a patient living miles away.

Recabling Britain

Unless the Government proceeds with care and agrees nationally-acceptable technical standards, its plans to recable Britain may result in the building of an electronic Tower of Babel, giving poorer communications at greater cost. This was the clear message from British Telecom Chairman Sir George Jefferson at a recent meeting of the British Computer Society.

In its submission to the Hunt report, British Telecom emphasises that the development and introduction of cable television must be seen as part of Britain's continuing investment in the telecommunications industry.

Lord Hunt's enquiry team has been gathering evidence from many sources, including broadcasting authorities and companies, trades unions, the CBI, advertising authorities and consumer associations. Indeed, in March this year, the Government's own information technology advisory panel (ITAP) recommended the development of a broadband cable system to be run by local monopolies in urban areas which included the suggestion that British Telecom should have no more than a consultative role in the recabling of Britain.

This, of course, would deny British Telecom's vast skills – in technology, field equipment, experience and expertise. The Corporation made it clear in its response to Lord Hunt that broadband cable television must be seen as part of the network and as an investment in information technology. But unlike the ITAP, British Telecom believes in a clear distinction between the carrier and the programme providers who would compete for the franchises.

According to Donald Wray, British Telecom's Director of Business Planning and Strategy, flexibility and longevity would be the best attributes of such a system. He suggests that a distribution system, with a switched 'multi-star configuration' would be best capable of carrying new information and advanced telecommunications services as they are developed.

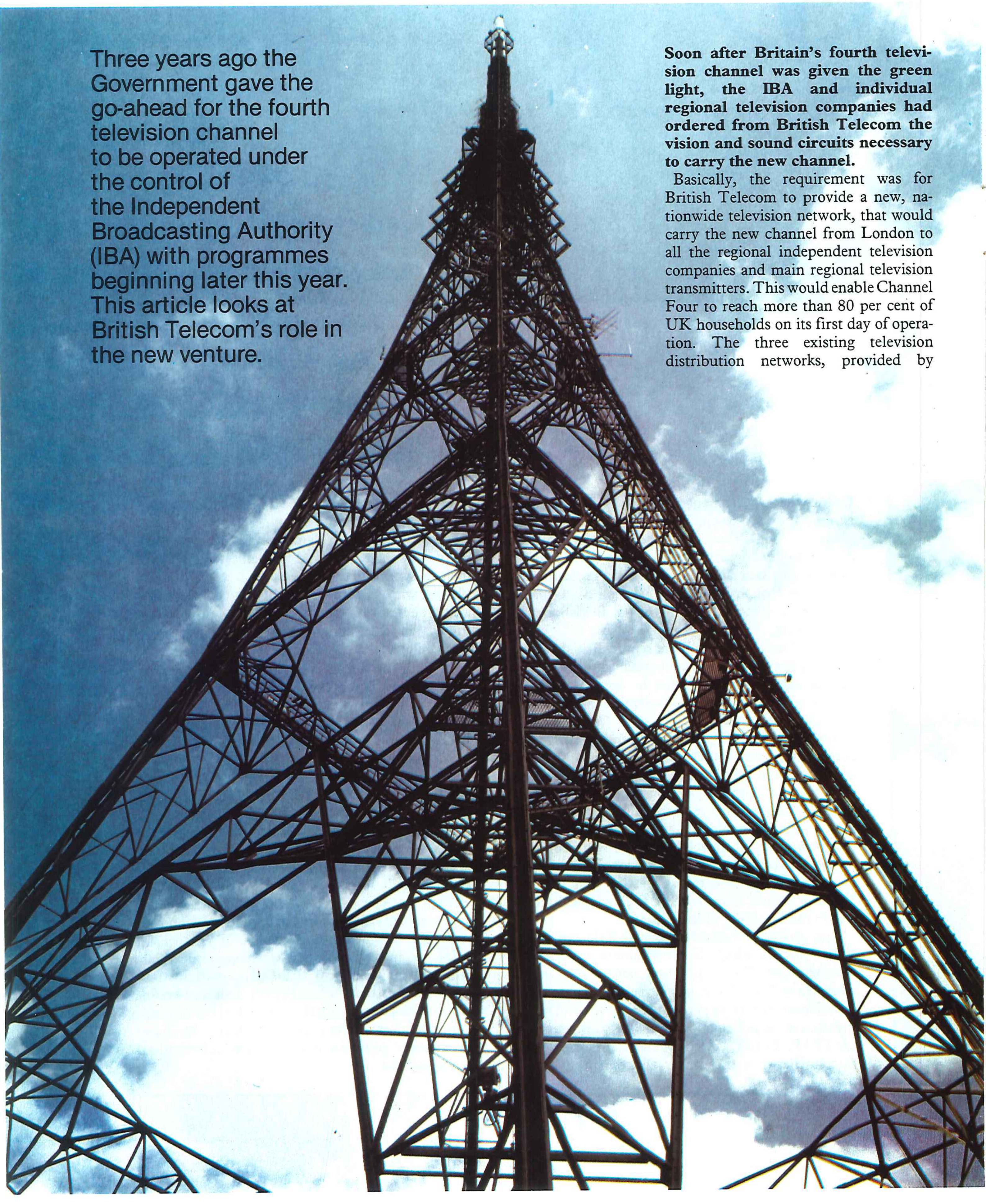
Although the future is in optical fibre, says Mr Wray, it is still too expensive. But a 30-channel coaxial cable would easily cater for the immediate demands of cable television, but it should be planned in such a way that it could evolve into the more complex systems of the future.

Already, British Telecom has embarked on an ambitious experiment in Milton Keynes, where 18 families are connected by fibre-optic cable which carries television, radio and other services into their homes. Known as Fibrevision, the network is a trial extension of the existing wideband coaxial cable system already serving the town.

British Telecom already has great experience in providing television links for broadcasters and in running cable television networks. It is a world leader in introducing new telecommunications technologies and services. By its active participation in new broadband cables, British Telecom could combine broadcasting and advanced telecommunications services on the same network and thus ease the nation's progress into the new information technology era.

K I Thomas

Tuning in to Channel 4



Three years ago the Government gave the go-ahead for the fourth television channel to be operated under the control of the Independent Broadcasting Authority (IBA) with programmes beginning later this year. This article looks at British Telecom's role in the new venture.

Soon after Britain's fourth television channel was given the green light, the IBA and individual regional television companies had ordered from British Telecom the vision and sound circuits necessary to carry the new channel.

Basically, the requirement was for British Telecom to provide a new, nationwide television network, that would carry the new channel from London to all the regional independent television companies and main regional television transmitters. This would enable Channel Four to reach more than 80 per cent of UK households on its first day of operation. The three existing television distribution networks, provided by

British Telecom for BBC1, BBC2 and ITV, had been installed in stages over a number of years, serving London first and then gradually spreading to the rest of the country.

The new IBA project was, of course, a major undertaking, requiring many new television transmitters to be installed throughout the country. Once the British Telecom network had been completed, sufficient time would be required for the IBA to carry out network tests, followed by trade transmissions for the domestic television retail and rental industry.

British Telecom had slightly less than three years to plan, specify, install and commission the new network which would comprise 23 microwave radio routes, (involving new equipment at 56 radio stations) and 40 cable links (requiring 130 km of new underground cable). Transmission performance had to be to such a standard that a programme produced in Scotland, for example, could be carried from Glasgow to London and then to the television transmitter at Inverness (a total route distance of some 1,600 km), without viewers noticing any impairment to their picture.

British Telecom staff began work as soon as the circuit orders were received. The first priority was to identify the routes requiring new cable or radio equipment. This resulted in contracts for £5 million for microwave radio equipment and £2.5 million for coaxial cable. A shortfall of video transmission equipment was also identified and emergency orders were placed with a number of small firms to make good the shortage. Delivery times requested were very short by normal standards, but constant liaison and co-operation between British Telecom and suppliers meant that, in the main, contract work and deliveries were on time.

Up to the end of last year, the major part of the work was the provision of underground cables, and the installation of video transmission equipment at British Telecom radio stations and repeater stations. Staff throughout the country were involved but work was hampered during the hard winter when some radio stations were cut off by heavy snowfalls for weeks. Underground cabling work was also delayed by the appalling weather conditions.

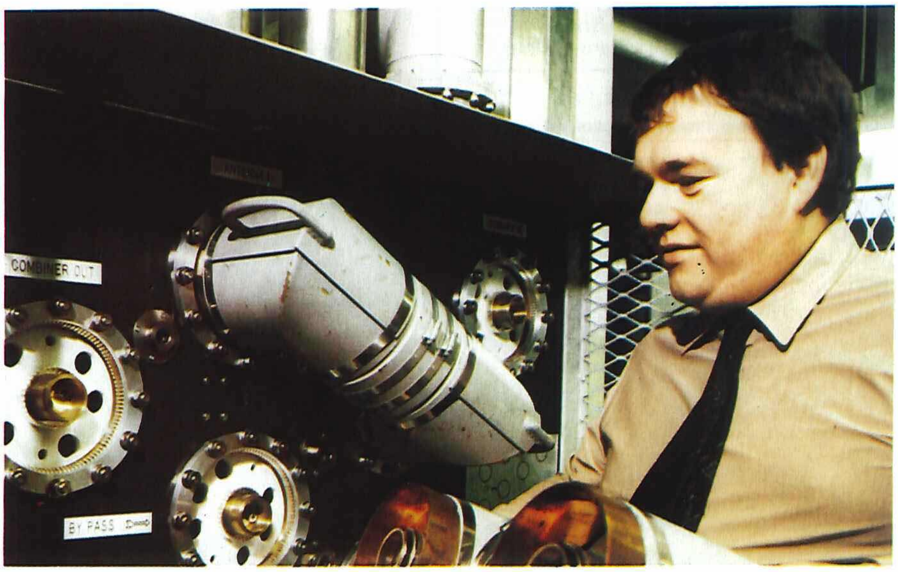
Many of the delays were made up early this year, however, and by April, the installation and line-up of the network was sufficiently advanced to provide a video circuit from ITN in London to Tyne-Tees Television in Newcastle – a total circuit length of 590 km. This circuit was to be the subject of special tests designed to check the overall performances of the network completed so far this year.

During the spring and early summer, most of the radio links were installed under contract by GEC. British Telecom regional transmission engineers supervised this work, and also carried out the task of lining-up the large number of video cable sections up and down the country, as well as commissioning and demonstrating the video feeds into the local studios.

As each main section was completed, it was handed over to a small team of engineers from British Telecom Headquarters to carry out, with regional and area help, the overall video line-up between the various television switching centres. This ensured that the network would perform to the exacting standards required. As the final completion date for the whole network approached, the pace of work increased as more and more network sections were handed over to the BTHQ team.

As with any major project, there were occasional problems. One of the most unexpected threatened to jeopardise installation work at the hub of the network, and involved a private firm completely unconnected with the project.

The Channel Four Television Company had occupied premises which were previously the Scala Theatre, and British Telecom had to lay a large coaxial cable from there to the nearby Telecom Tower to carry the fourth channel programme into the main network. It was discovered, however, that an air-conditioning duct belonging to another tenant of the theatre building blocked the cable entrance from the pavement outside. After some complicated negotiations, the tenant agreed to divert the route of the ducting, and the delay in providing the video circuits was



These six-inch coaxial U-links are used to connect aerial power feeds.

Bert Herring and Colin Harman patch a cord into the Crystal Palace circuit during a line test from the television switching centre at London's Telecom Tower in the heart of the West End.

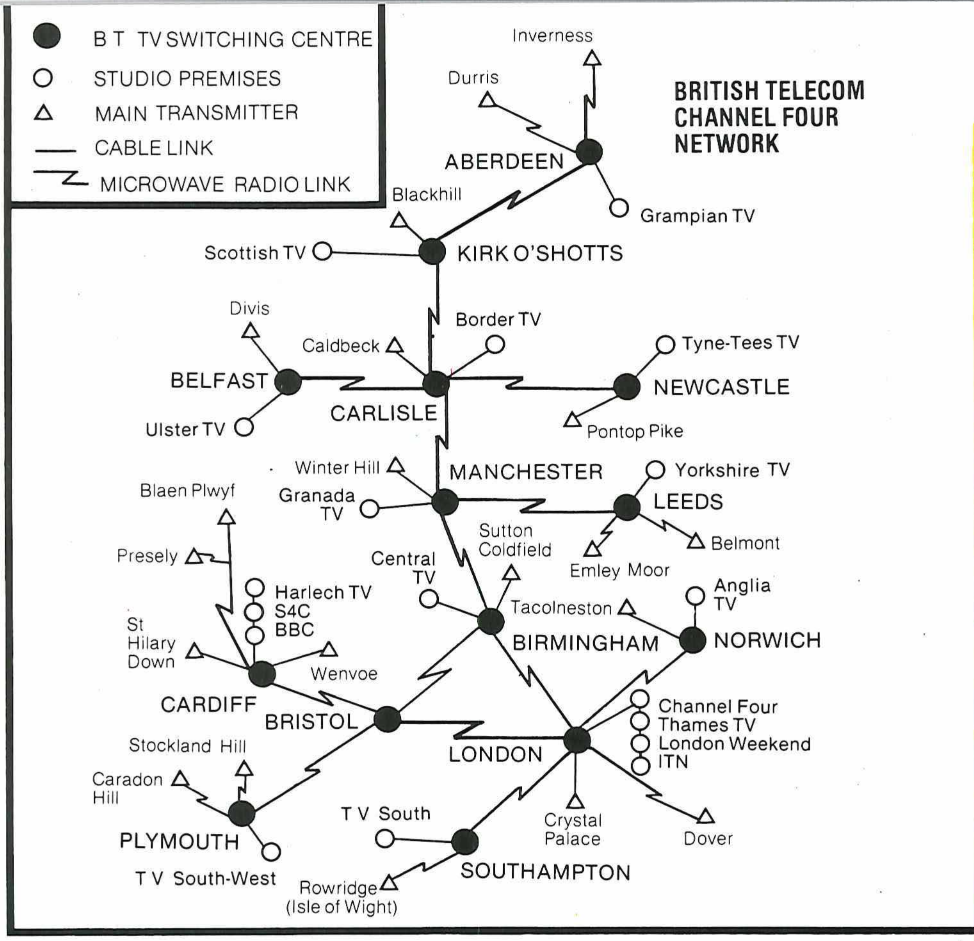
made up by the efforts of regional and area staff.

By early August, the British Telecom network was completed, except in Cardiff where the new premises have only recently been completed, and in Carlisle, where the same situation exists with the local programme company there. Arrangements were made however, to bring the network into operation, and the IBA began trade test transmissions from the main transmitters.

Thus a new era in British television is about to begin and British Telecom can feel satisfied that it has played a major role in bringing a greater viewing choice to millions of homes throughout the country.

Mr K. I. Thomas is an executive engineer in Network Executive's television network and systems planning group and has special responsibility for Channel Four.

British Telecom Journal, Summer 1982



BRITISH TELECOM CHANNEL FOUR NETWORK

The network is centred on the London Telecom Tower, home of British Telecom's London television switching centre, and the new fourth channel will be fed into the network from the recently-formed Channel Four Television Company, sited within the shadow of the Tower. Underground cables will carry the programme into the London television switching centre, from where the distribution network will carry them to regional Independent Television studios throughout the country.

The video network will carry more than just the vision part of the transmitted programme. IBA will employ equipment using a technique called 'sound-in-sync' which allows the accompanying sound to be carried as a pulse code modulation (PCM) signal, superimposed on the video signal. There will also be a control data system also superimposed on the video signal, to enable video tape machines in the regional studios to be cued and controlled from the company's headquarters.

At each regional centre, British Telecom cables will feed the Fourth Channel programme from the video distribution network to the local Independent Television studios. There, the superimposed sound and control signals will be decoded, and, at programme breaks, local advertisements inserted. The advertisements will be prerecorded on video tape, and the operation of the machines which play the tapes will be controlled from London through the control data system. The sound and vision signals will then be carried separately on British Telecom cables to the main television transmitters located in that region. Where transmitters are many miles from the studio centre, further microwave radio links are provided instead of cable.

For the London area, there are two independent television studios, Thames Television and London Weekend Television. British Telecom will feed fourth channel programmes to both these studios from the television switching centre. The sound-in-sync signals will be decoded, advertisements inserted in programme breaks, and the separate sound and vision fed back to the television switching centre. There, British Telecom will select the feed coming from either Thames Television during the week, or LWT at weekends, and switch it onto the cable link feeding the London area television transmitter at Crystal Palace.

The fourth channel in England, Scotland and Northern Ireland will carry news programmes from Independent Television News in London. Cable connections will carry the news programmes from ITN, via the Fourth Channel Company and London Telecom Tower, to each regional company. In Wales, however, a different arrangement will apply. The programme feed from London will be carried into the Harlech television studios in Cardiff. Advertising material for the west of England region will be inserted, and the programme carried on IBA microwave links to the main transmitter situated at Mendip.

The fourth channel for Wales will originate from a newly-formed authority, Sianel 4 Cymru – otherwise known as S4C, based in Cardiff. The S4C programme will be carried to the Harlech studios, where advertisements will be inserted, and then on British Telecom microwave links to the main transmitters in Wales. Some of the material for the Welsh fourth channel will be provided by the BBC, and carried on British Telecom links from Broadcasting House in London to S4C in Cardiff.

The Channel Four Television Company in London and S4C in Cardiff will not actually produce individual programmes, but will buy or commission programmes from independent producers throughout the country, including the regional television companies. To help transfer programme material from regional centres to the Channel Four Company and S4C, British Telecom is providing a contribution network, complementary to the distribution network.

This network consists of cable and microwave radio links from Carlisle television switching centre to London via Manchester, Birmingham and Bristol. Access to this network will be available from most parts of the country through British Telecom's regional television switching centres. Thus the independent producers will have a readily available means of selling their own programmes to the fourth channel.

AT YOUR SERVICE...

M L Daniels

British Telecom Factories . . . Behind this deceptively simple title lies an extraordinary range of products and services which are available at all times to all parts of British Telecom.

Many Factories products, such as the host of labels and signs used throughout the Business are taken for granted while others like the newly-developed small business computers (SBCs) are less visible but potentially of tremendous value. From the very simple to the highly complex, Factories have products and services to meet all British Telecom's needs, and a recent major reorganisation has streamlined the whole operation to make it even more effective.

Factories aims to provide a comprehensive and competitive service with speedy deliveries in all areas of its activities. Some of the wide range of skills and facilities available include:

* Design and manufacture of printed circuit boards,
* Electronic servicing,
* Instrument calibration,
* Computer-aided draughting,
* Ultrasonic cleaning,
* Label design and production.

Providing these services is a staff of nearly 4,000 at sites in Birmingham, London, Cwmcarn and Edinburgh. Their knowledge and expertise enables them to undertake work from production engineering and manufacture, to repair and refurbishment, producing an annual turnover worth £100 million to British Telecom. Added to this is more than 100 years of operational experience providing a pool of professional advice in all areas of production.

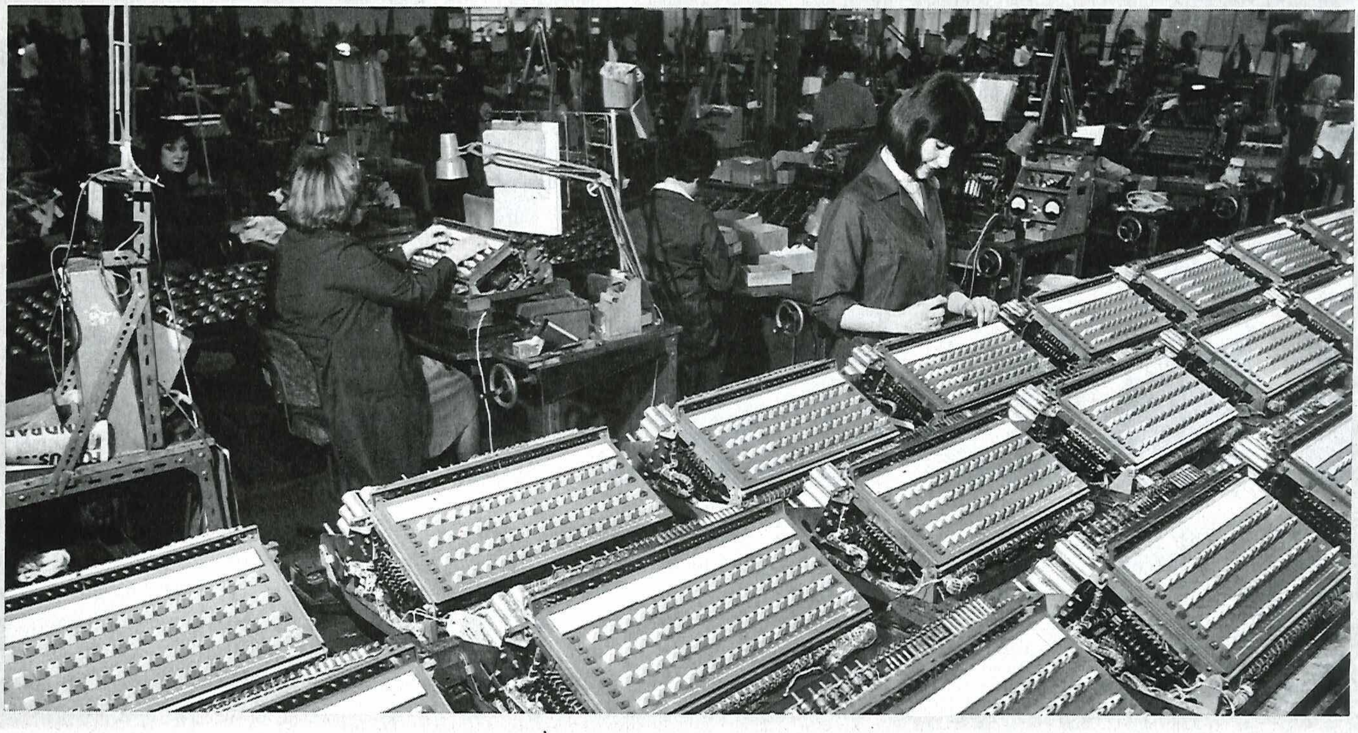
At Birmingham can be found the core of Factories product development activities. Here, the development of clients' ideas to the prototype stage and beyond are speedily progressed with the help of computer-aided draughting facilities. These convert circuit concepts into printed circuit board (PCB) designs which, with the aid of associated printing equipment, can be converted to PCB masks for production runs, thus quickly transforming ideas into reality.

A current example of this ability is the development of the air defence electronic keyboard, a complex microprocessor – controlled communication concentrator. Quickly developed for external users such as the Ministry of Defence and the Civil Aviation Authority, it is a good example of the advantages to be gained by using Factories capabilities. Other major advantages which Factories offer include:-

* British Telecom gaining lead time to the market,
* Customised system facilities being incorporated into the design at minimal cost and delay,
* Back up in system enhancement, modification and repair.

Stepping from product development to manufacture, facilities in Factories are best suited to smaller specialised production runs. This includes manufacture of testers, relays, printed circuit boards, and many types of advanced electrical equipment. With its cabinet makers and skilled metalwork and electrical staff, Factories can provide a

Staff at Enfield Factory refurbishing small private manual branch exchanges (PMBXs).



flexible and comprehensive service to undertake work ranging from small scale individual unit production to large-scale flowline production.

Complementary to this is a piecepart service of 35,000 items, consisting of the specialised manufacture of non-standard parts by a machine shop in addition to the stockholding of items required by British Telecom engineers. These are used both for the maintenance of telephone exchanges repeater stations, datel and telegraph equipment throughout the UK, and as a back-up for refurbished apparatus sold to overseas markets via Teletrade, a commercial arm of British Telecom providing cut price equipment to third world countries (See *British Telecom Journal*, Spring 1982).

Factories aim is to increase manufacturing and construction capacity and to keep abreast of the rapid technological and organisational changes affecting British Telecom. To help achieve this, customer service is being improved with computerised progress control and tighter delivery, providing a competitive efficient 'in-house' manufacturing and servicing facility.

Most work carried out by Factories conforms to customers' specifications but where there is a clear advantage for British Telecom, Factories initiates the development of its own products. An example of this is the Factories small business computer (SBC). This has been terminal to a multiuser, multi-processor system which provides for up to 16 terminals at any one time. Initially the objective is to market these within British Telecom both as a Factories product and through Data Processing Executive, but as the market expands the possibility of a partnership with a software house is being explored and this may lead to the production of a complete package for specialised customer groups in the communications industries.

From product development to manufacture in a diverse range of items, Factories is providing a competitive and efficient service with definite advantages for the business as a whole. But beyond manufacture, Factories also has excellent facilities for repair maintenance and modification.

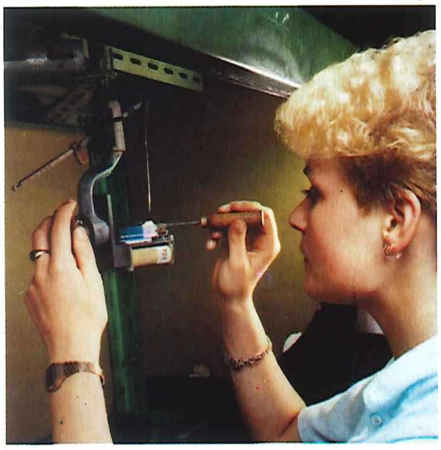
From simple repair to complete refurbishment, Factories process more than 500 product types each year ranging from pulse code modulation equipment and digital testers to high volume products such as the 1.5 million telephones which pass through the division each year. All work is completed to clients specifications which can vary from simple cleaning, adjustments and testing to 'good as new'. But whatever the requirements, Factories aims for the highest standards of reliability at low cost. In 1980/81, for example, the total cost of all equipment repair work was £37 million – less than half the £76 million it would and more items of equipment are recovered from the British network and replaced by digital equipment, so some of this can be sold abroad to developing countries who cannot yet afford the latest equipment.

Another growth area is the production of the new Phoenix Phone range, now being manufactured in a range of designs and colours at Cwmcarn factory. Based on the trimphone, Phoenix Phones incorporate refurbished expensive electronic and electrical components with all remaining parts replaced by new. Lower production costs mean that the phones can be sold at a very competitive price and indeed now form the lowest priced model in British Telecom's new range of telephones.

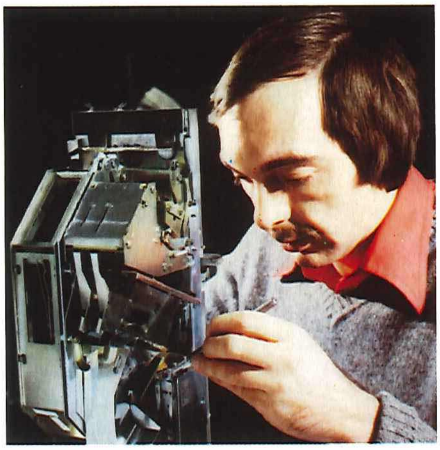
One of the most unusual aspects of Factories work is its label-making facility at Cwmcarn which may well be the largest of its kind in Europe. Here there are more than 60 machines turning out thousands of labels each week for use in all parts of British Telecom.

Labels are made for use in a wide range of environments and for a multitude of purposes, from identifying circuit or channel numbers in equipment to drawing attention to safety hazards. They are manufactured in a number of ways but usually by a hot press method where characters are transferred onto thermoplastic materials. Other popular processes include silk screen printing or,

Work at British Telecom Factories includes:
Adjusting relay contacts;



Repairing coinboxes;



Tracing faults with Membrain automatic test equipment;

designed and developed by Factories in association with Data Processing Executive and a number are already in operation throughout the business with volume production soon to start.

The SBCs range from an intelligent have cost to replace all this equipment with new.

One important customer, Teletrade, has given Factories a new area of expansion for its refurbished work through the overseas market. As more in the case of metals and other hard materials, by machine engraving.

Fully realising that customers within British Telecom cannot afford to use Factories services unless they are fully competitive, the division has taken steps

Factories first became part of the Post Office in 1870 almost by accident. It was at that time that the country's telegraph system was taken over and two factories – one in London and one at Bolton in Lancashire – were among the acquisitions.

With them came 175 staff whose main job was the manufacture and repair of telegraph equipment and batteries. Today, with a total of eight factories in London, Birmingham, Edinburgh and South Wales and a staff complement of nearly 4,000, British Telecom's Factories Division is a vital resource, particularly in the new competitive environment.

In the factories . . .

★ More than 1,000 different items of equipment are repaired;
★ Total value of equipment manufactured during a year is running at more than £7 million;
★ About 35,000 items are stocked and issued on demand for the maintenance of telephone exchanges, repeater stations, datel and telegraphic equipment;
★ In 1980/81, recovered equipment was restored to 'as new' at a cost of £37 million. Cost of replacement by new equipment would have been £76 million.

to streamline its structure. One of the most important aspects of this has been the development of Factories marketing capability.

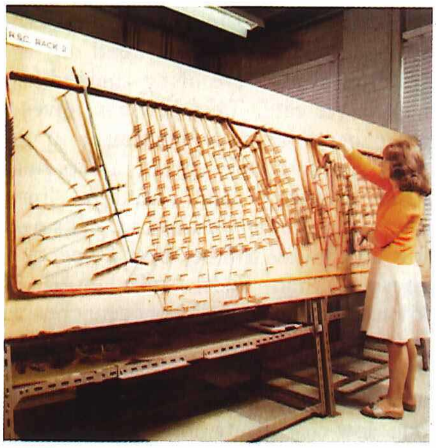
Factories marketing division aims to fulfil two objectives vital to future development. First it aims to tell customers both inside and outside British Telecom about its current and developing capabilities to secure its present position in the market. Secondly, by using market research to gauge present and future needs within the corporation it will develop a policy to guide Factories towards meeting these effectively. The development of a comprehensive marketing policy and strategy is seen as an important step towards transforming the relationship between Factories and British Telecom as a whole, making both aware of the potential benefits to be derived by fully using present and future resources.

Towards this aim, several developments have already taken place. Most importantly, the whole basis by which orders are processed, work allocated and market needs examined have been put on a new footing. This has been achieved by reorganising departments on a product basis under the direction of a marketing product manager in each of the principal areas. This has resulted in a far greater degree of flexibility and the capability for rapid response to new market demands. Added to this, a public relations officer has been appointed with the aim of keeping British Telecom staff informed of the services available and the developments planned for the future.

For the future, it is also planned to establish a sales force whose task will be to develop close relationships with customers and to keep Factories fully in touch with customer requirements. As well as selling services and products, their knowledge and expertise will help them to identify new opportunities for expansion and development.

With the support of an experienced and wide ranging work force Factories is now set to go forward into the 1980s as a competitive, market-orientated unit which will positively seek to influence the continuing success of all parts of British Telecom.

Making a large cable form;



Refurbishing telephones;

Examples of label production at Cwmcarn.

Miss M. L. Daniels is public relations officer for British Telecom Procurement Executive's Factories Division.

British Telecom Journal, Summer 1982

Getting the price right

D Miller

In the new competitive climate, it is essential that each product or service provided by British Telecom should pay its own way. One effect is that tariff policy is now being looked at to ensure that there are similar levels of profitability for all rental and call charges.

Although tariff changes in 1980 and last year have helped to improve profitability generally, there are still wide variations between different sectors. In the main, long-distance – trunk and international – telephone calls have been providing most of the profit on which British Telecom depends for financing its essential investment programme. Clearly this has been unfair because the customers who make most trunk and international calls have been subsidising the service enjoyed by other customers.

The changes in British Telecom's monopoly and the approach of competing alternative services has further strengthened the case for ensuring that each product or service is correctly priced. Any item which is overpriced is especially liable to be undercut by competing services. It is important therefore to align British Telecom's charges as closely as possible to actual costs. This can be achieved by pricing at economic levels, while still ensuring the high standards of service customers are entitled to expect.

Although some prices will need to be adjusted, the speed at which these changes have been introduced is governed by the overall revenue requirements of the business, and the effect that the changes have on individual customer's bills. The effect of suddenly increasing exchange line rentals and reducing trunk call prices for example would hit hard at residential and small business users for whom rental forms a major part of the telephone bill.

Recent tariff changes – January and November 1980 and November 1981 – have been designed to improve the balance of profitability between the various services with tolerable increases on average bills – although some customers strongly dispute the reasonableness of the changes that have been made. Less has been added to long distance call charges than local calls and exchange line, apparatus, extension and private circuit rentals.

Last November's changes included adjustments to charges for international telephone calls to provide a common charge for all of Western Europe, with small increases on charges to countries in Band I (nearest to the UK) and reductions in charges to countries in Band II. Charges to countries in Band V were also reduced. In February this year, charges for calls to North America and the Caribbean (Band IV) were cut by a third, the first in a series of significant price reductions.

These were then followed in May by reductions in long-distance trunk call charges which will be achieved by increasing time allowances for the unit fee for most calls over 56 kilometres. Adjustments will be in two forms – First, the time allowed for the unit fee on calls from ordinary lines on routes over 56 kilometres – is being increased, so reducing charges by about 17 per cent at the peak rate, and about 20 per cent at the standard rate compared with charges from 1 November 1981. This broadly restores the pre-November 1981 level. In the 1982/83 financial year, this change will reduce trunk call revenue by about £150 million. Charges for cheap rate call calls are unchanged.

Secondly, calls made over 100 low-cost trunk routes, which carry high volumes of traffic between the charge group of the trunk exchange at each end of the specified routes, are being charged at a new lower rate. This new rate gives a more generous time allowance in the peak standard and cheap rate periods from ordinary and coinbox lines. Depending on call durations, calls over low-cost routes will be about 20 per cent cheaper than most calls over 56 kilometres and about 33 per cent cheaper than they have been since November last year. More than half of all exchange connections will have access to at least one low-cost route and more than a quarter of all calls over 56 kilometres will attract the lower charges. In the 1982/83 financial year, this change will reduce trunk call revenue by £50 million.

The chart on page 9 shows the changes made to time allowances and charges for calls from ordinary lines on routes over 56 kilometres since November 1981.

Telephone bills – the balance between rentals and call charges must be acceptable to the customer.

Dialled calls from ordinary lines				
	Time allowance for unit fee (4.0p) Pre-November 1981		Time allowance for unit fee (4.3p)	
			From November 1981	From May 1982
	Rate	*Time (secs)*	*Time (secs)*	*Time (secs)*
b	Peak	10	10	12
	Standard	15	12.86	16
	Cheap	48	48	48
b1	Peak			15
Low-cost	Standard			20
routes	Cheap			60

Ideally, charging arrangements should be flexible. The overall aim is to charge the customer at cost price plus a reasonable profit for services provided. But this would require a new range of differential charges based on the characteristics of individual routes and the use individual customers make of the system. In practice, the range of charges is limited by the facilities available for recording and billing calls.

Although better, more flexible facilities are on their way, for the time being the best possible use of existing facilities must be made to meet, as far as practicable, the overall tariff objectives of the business. Limitations of the existing system mean that on the whole the only practical approach is to differentiate in terms of the whole of a charge group served by a trunk exchange and the whole of routes between such exchanges.

It was against this background that the concept of route pricing developed. Lower prices on 'low-cost' routes reflect the economics of direct connection between the trunk exchanges concerned – rather than routing via an intermediate trunk exchange – and the savings achieved by carrying high volumes of traffic. Reduction in revenue from introducing route pricing and changes in trunk call prices is constrained by the overall revenue requirements of the business and the need to work towards balancing the profitability of individual services against the effect on bills. Also taken into account has been the counter-balancing effect of recent adjustments to the unit fee, needed to maintain other trunk and local call prices at economic rates.

The net result of these changes is that in the 1982/83 financial year, the balance of profitability between services will be improved substantially, although there is still more to be done. But with last November's and May's changes, local calls will show an improved position while trunk calls will be less profitable than would otherwise be the case.

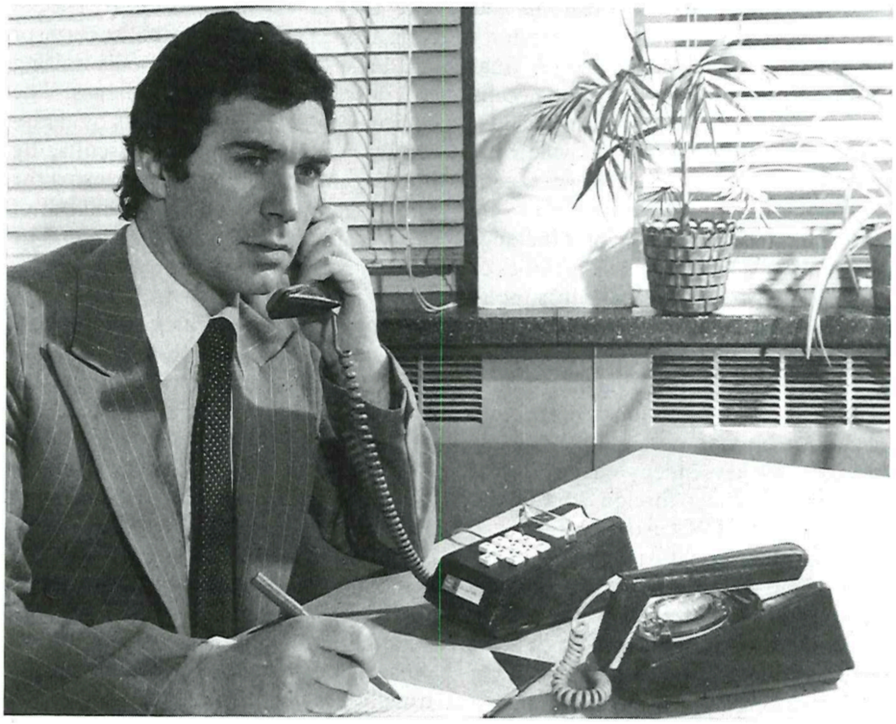
In the next few years, tariffs will be used to reflect a balance between acceptable profits in the main market sectors and tolerable bill increases. This means that residential exchange line rentals will need to be increased proportionately more than the average – business exchange line rentals have already been increased substantially – while trunk call charges should continue to be reduced in real terms, probably by reducing most call prices while maintaining the differential established on 'low-cost' routes.

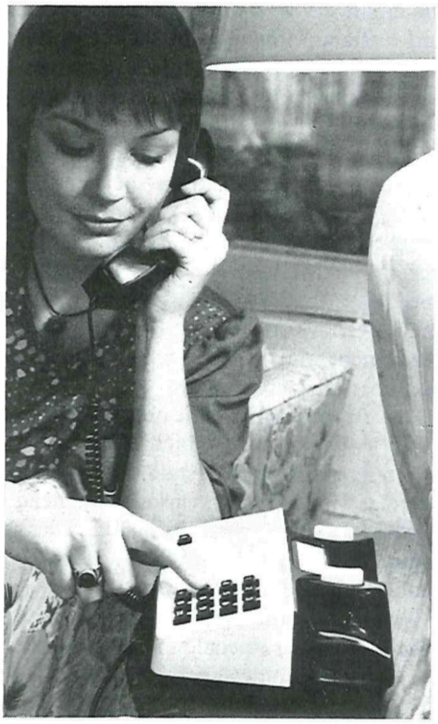
In so doing, the basic strategy will be to cover the costs of individual items and ensure that the overall revenue needs of the business are met while adapting tariff structures to meet market conditions and customer expectations.

Mr D. Miller is a head of group in Inland Customer Services Department.
His responsibilities include tariff policy for inland operator and dialled telephone calls.

British Telecom Journal, Summer 1982

Because residential and business customers would be affected most by changing pricing structures, adjustments must be gradually introduced.





Speedier search for numbers worldwide

J H Fisher & J G Cross

The first stage of a strategy to improve the international directory enquiry service has been completed by the provision of a modern purpose-built centre at Kelvin House, London.

In recent years, the rapid growth of international telephone traffic has been reflected in the demand for international directory enquiry (IDQ) services. International calls have risen from around 39 million to over 250 million in the last ten years and it became apparent during the late 1970s that the existing facilities, fragmented over several central London buildings, would be unable to cope with increasing demand.

The system also suffered from

Technical officer Barry Cook tests a faulty console on the test rack which was formerly a prototype for international directory enquiry equipment.

How it works...

Co-operation has played a key role in the Kelvin House project – from managers who specified the operational facilities and whose co-ordinating efforts have brought the unit to operational readiness, the engineers who developed, produced and installed the equipment and the switchroom furniture, to the unions whose staff will operate, manage and maintain the centre.

Staff associations were consulted throughout by the planning teams and, in 1980, discussions led to a trial using prototype versions of the operator's and assistant supervisor's answering units and two operator's desks. For two weeks they dealt with live traffic to check equipment and desk designs, facilities, and operating procedures.

The trial highlighted the need for minor modifications, all of which were incorporated into the final installation. A later exercise showed how various overhead lighting reacted with individual desk lighting and helped provide the best way of illuminating directory pages.

Once the main equipment had been installed it was subjected to a programme of test calls designed to simulate operational conditions. Hundreds of calls were made to a specially-provided code that would route into the queuing equipment. Test calls were also made over all the newly-provided circuits into the queuing equipment. All calls were answered at the operating positions and used to test the queues and the operator's and supervisor's desk facilities. A final saturation test involved routing calls simultaneously on all incoming circuits, and was followed by an hour when the unit was subjected to a 50 per cent overload.

The operator's answering unit includes four connect circuits and has facilities to transfer calls from the main to supplementary queue, to reroute calls from code 102 to 103 and vice versa, and to connect calls to an assistant supervisor.

Access to all international routes and the UK telephone network is available through a keysender enabling the operator to contact foreign administrations and recall UK customers.

The assistant supervisor's unit allows the section supervisor to receive calls from any of the operators in the section and to make and receive calls from other supervisors. Displays show the number of calls waiting to be answered as well as the number of positions fully staffed.

The divisional supervisor is in charge of switchroom operations and has an answering unit which allows her to make or receive calls from assistant supervisors and the chief supervisor. A special console next to the divisional supervisor again shows the number of calls waiting and positions staffed in all queues. The console can also restrict access by temporarily blocking incoming circuits, by limiting the size of queues, by closing the bureau completely and by taking out of service any faulty connect circuit. The chief supervisor has a unit which shows calls waiting in all queues.

Quality of service figures are provided through the directory enquiry management statistics information equipment specially programmed by British Telecom International engineers. This prints a record of calls offered and answered, average time taken by operators to answer calls, and average call handling time for each of the queues, both separately and combined. It also provides information about circuits busied for long periods and outgoing circuit group congestion. Print-outs can be produced on demand but are usually provided three times daily.

significant weaknesses. With no direct customer access to an IDQ centre, calls were directed via one or more intermediate operators and without a formal call queuing system, calls were answered at random. In addition, operators worked from modified conventional switchboards which did not allow easy access to large numbers of paper directories.

The new 48-operator position centre in Camden – formerly a telegraph equipment floor designed, equipped and furnished in-house – opened in April. It will handle dialled enquiries from London-based customers using code '102' for linguist operator routes and code '103' for English-speaking operator routes. All other IDQ enquiries will continue to be handled by existing facilities until the next stage in the strategy is completed – the opening of a second centre planned for June next year, at Irvine, Scotland.

Because no suitable in-house or commercial equipment was available at the planning stage, it was decided to modify the national DQ Strowger call queuing system. This meant providing a two-level queuing arrangement, access to international circuits and the development of a new family of answering units. It was a good time to break from traditional switchroom furniture and layout to provide a new corporate design which was not only compatible operationally but was pleasant to work in.

The operating suite accommodation was designed with the help of external consultants while the switching equipment and the answering units were built by Factories Division. Staff in International Automatic Services built the furniture and carried out all the engineering installation work.

The installation comprises three separate queues, one serving code '102' traffic and two serving '103' traffic. Each queue is sub-divided into a 'main' and a 'supplementary' queue served by ten and six operating positions respectively. This subdivision means that an enquiry, the answer to which could be in any one of 3,000 different directories, is dealt with in the most speedy and efficient manner.

Incoming calls are first directed to a main queue operator who has a selection of the most commonly-used directories enabling her to deal with up to 70 per cent of all enquiries. If she does not hold the information, the call is transferred to a supplementary queue operator who holds a further selection of directories and has ready access to bookshelves containing the overflow. Where an

Telecom officer Nick Damonte explains Demsie – directory enquiry management statistical information equipment – printouts to a group of Kelvin House assistant supervisors.

enquiry cannot be met, operators can contact overseas centres. An overseas operator can call back with information to one of six positions with priority recall facilities which can be directly accessed. Once the information has been obtained, a Kelvin House operator can recall a UK customer.

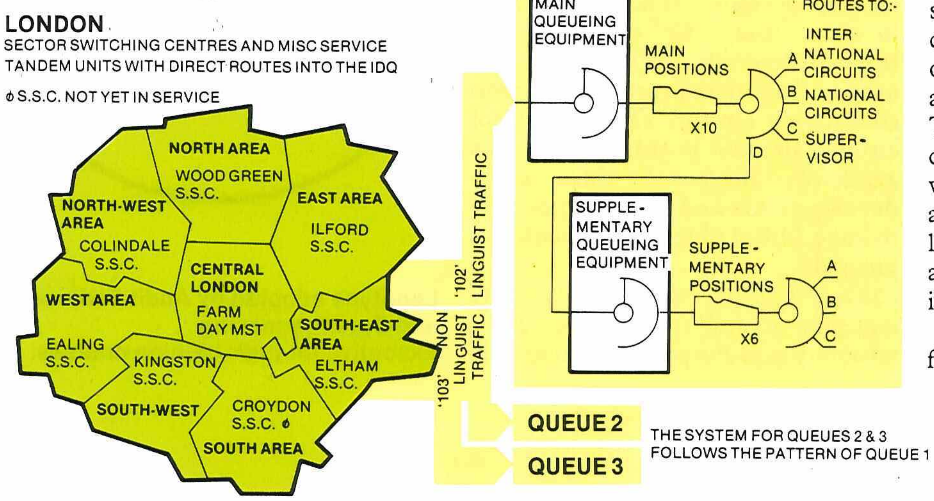
Because international and national network access is required as well as other new facilities, a new answering unit design has been developed. Pleasing to the eye, easy to maintain and simple to use, the new unit comprises an attractive pressed steel case, finished in a hard wearing suede-like textured paint, and houses components mounted on printed circuit boards. The facia consists of illuminated push buttons for controlling and supervising incoming and outgoing calls, call transfer facilities to supplementary operators and assistant supervisors, plus a special keypad for international calls. There are variants, using the same case design, for assistant supervisors, supervisors, and the chief supervisor. Units for assistant supervisors incorporate a line of light display of calls queuing for answer as well as a display of operating positions in use.

Specifications for the design of furniture were developed by a consul-

Kelvin House telephonist Keith Wynter searches for an overseas number on a main queue operator position.

About 30 per cent of all incoming enquiries are routed to a supplementary queue position. Here, telephonist Terri Kolosinska deals with another enquiry.

KELVIN HOUSE IDQ SYSTEM BLOCK SCHEMATIC



tant. The operating positions, in clusters of eight, feature a shaped desk top with rear shelves capable of holding 45 directories, individual fully-controllable lighting and personal lockers. Matching supervisors' desks and two-tier, free-standing bookcases have also been provided.

The old apparatus room – once housing teleprinter automatic switching system (TASS) equipment – was converted by constructing a raised carpet tiled floor for underfloor cabling. As well as carrying flush-mounted linear fluorescent lighting, the suspended ceiling forms an integral part of the heating and ventilation system incorporating perforated acoustic, thermal steel tiles. These form a pressurised void to the structural ceiling resulting in an even and draught-free air circulation.

The light, open atmosphere has been achieved by providing a plain background and a reliance on colours, natural materials and well-proportioned mouldings to provide interesting features. These include ramp safety rails designed as a piece of metal sculpture, retention of original glazed mahogany partitions, original 1930s refurbished clocks and sculptured timber surrounds and colour banding to structural columns. A personal touch has been added by the use of coloured wall fabrics, blinds, mirrors and a variety of floor standing plants.

A new microprocessor-based system – known as directory enquiry management statistical information equipment – will be used to provide regular facts and figures printed out on a teleprinter in the operating suite. The system is based on the national portable traffic analysis equipment – known as PTAE – with a software package developed within British Telecom International.

The new centre has already begun to play its part in providing an efficient and friendly service and customers, and staff will benefit from the new complex which is helping British Telecom to fulfil its promise to improve the quality and efficiency of the international directory enquiry service.

Mr J. H. Fisher is an executive engineer and is in the group responsible for planning contract and direct labour works at ICCs and ISCs. He is based in BTI's Switching System's Implementation Division.

Mr J. G. Cross is the exchange superintendent at Kelvin House and was involved in the opening arrangements.

Computing the cost

J A Foord and A J James

The past ten years have seen massive growth in the use of small business computers worldwide. This growth has, of course, been reflected in British Telecom, with latest estimates for expenditure reaching £25 million by March 1984. This article looks at the problems of controlling the growth of these systems and how audit staff are meeting the challenge of the chip.

The small business computer (SBC) is the result of the technological developments of LSI (large scale integration) circuits in the 1970s which led to the development of the microprocessor. The technology involves the use of layers of impregnated silicon-film overlayed onto one another producing a semi-conducting circuit. The number of circuits printed in this manner has gradually increased since early developments and it is now possible to have 10,000 individual circuits on one chip.

Microprocessors were first used for industrial control applications, suiting reliability, cost and plug-in features well. The output from the processor was in the form of electrical pulses which in turn controlled electromechanical devices. The pre-set sequence of instructions required to operate the microprocessor were hardwired into the chip. By making the microprocessor dependent on a range of instructions external to the actual processor and by storing the microprocessor program in 'memory', the dedicated microprocessor is turned into the general purpose computer.

It was not very long before industry realised that the addition of a memory, backing store, a visual display unit (VDU), a printer, and a power supply to the microprocessor produces a microcomputer. With operating systems and

Logotype adopted by Audit Division and Data Processing Executive for their training courses.

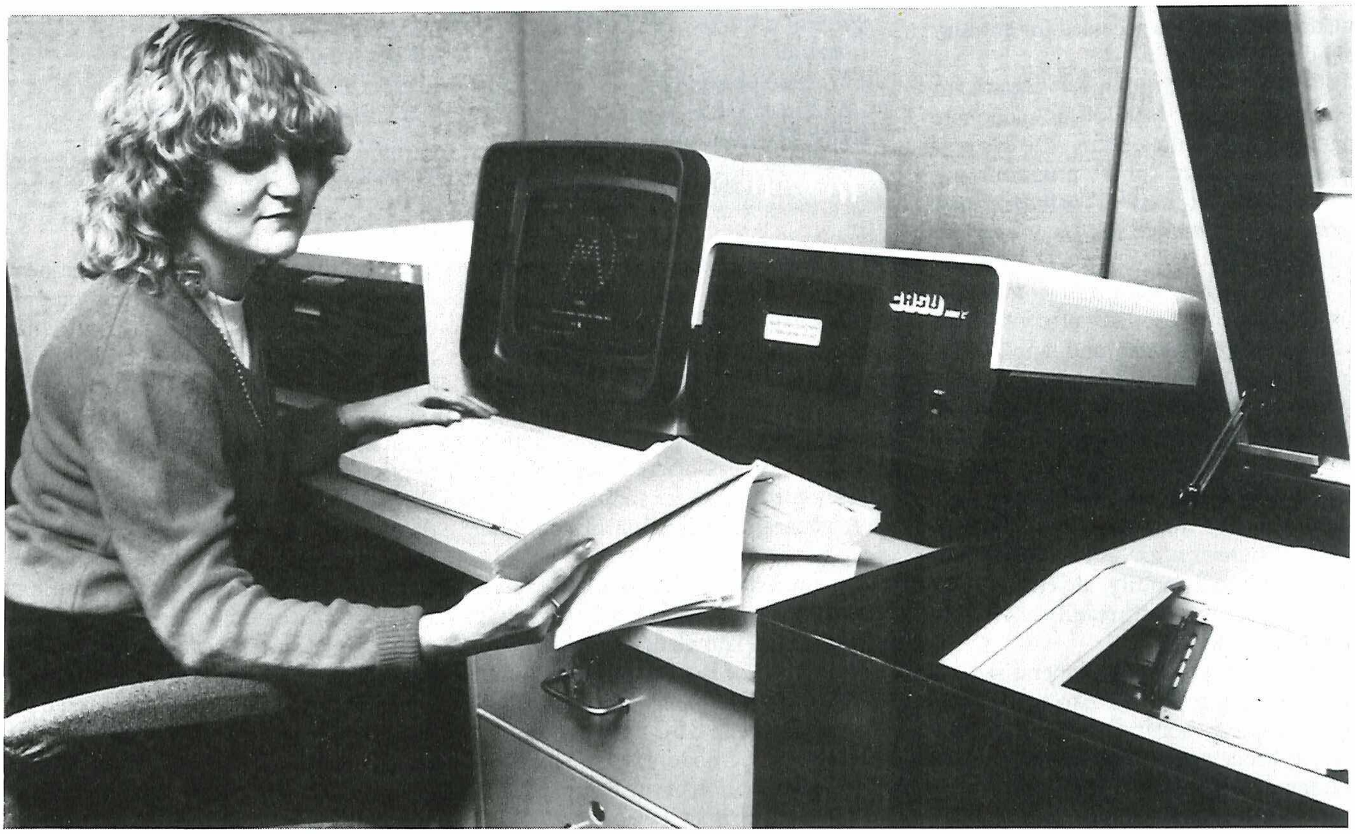
applications software, the result is a usable microcomputer system, which British Telecom have called small business computers.

British Telecom design engineers have been involved with the chip since the late 1960s when they were specifying the inclusion of microprocessors in equipment made by contractors, and were even designing and programming their own items using the new components.

In late 1978, the Data Processing Executive and the Management Services and Systems Department noted that regional and area users were purchasing 'desk-top computers' – usually on the office equipment budget. Rather than stop people using microcomputers, even bolic instruction code (BASIC) is the most common language on SBCs, the systems within Telecom also support a number of other programming languages including COBOL, FORTRAN, ALGOL and PL1. There are also a number of utility packages available like Supersort, a database management package, and a report generator.

The first SBC installations (in an office as opposed to an exchange environment) were used to eliminate routine, repetitive work such as the provision of statistics or management information. But as more and more machines became available, and operating experience grew, so it was inevitable that new uses would be found, particularly those of a financial or computer-based – telephone billing, payroll, and stores. But all these systems had been developed in a controlled data processing environment using skilled staff and are all centralised in that each system services all 61 telephone areas. Thus the task of ensuring the adequacy of controls, though not easy, is nonetheless straightforward.

This is not the case with small business computers. In September 1980, a management audit was set up (using a joint team from the Data Processing Executive and Audit Division to examine the financial implications of the decision to buy SBCs in large numbers for use in area offices. The audit team discovered that many local systems had been



Clerical officer Joanna Berrycloth inputs information on to Microtex – a computer-based telex billing system developed by Data Processing Executive.

assuming it were possible, it was decided to provide users with a British Telecom-supplied SBC that was as good or better than any on the market, was fully supported, could be seen to have a forward growth path, and was readily available.

At an early stage, it quickly became apparent that hardware was not as important as software, particularly on the operating system. Fortunately, one system on the market was recognised as a very good product and rapidly became the *de facto* industry standard. This is the Digital Research Corporation's CP/M operating system.

Although beginners all-purpose sym- accounting nature. Typical applications now include text editing and entry, data capture onto floppy disc, local processing, word processing systems, computer-aided training, payroll systems, report generation, graphics and program development. Technological improvements in both hardware and software also meant that although SBCs were becoming cheaper, they were more efficient and more sophisticated.

From an audit point of view, this latter development posed certain problems. True, audit staff had been looking at computerised systems and operations for many years. Indeed, British Telecom's major accounting systems are all developed and designed with little or no reference to other area projects and without using the professional expertise of DPE staff. It was therefore not surprising that the audit report published last year was critical of the lack of co-ordination and control over local computing and its development throughout the Business.

It was also clear that SBCs were just one element in British Telecom's overall objective to decentralise computing responsibility. But Audit Division's concern was not so much to do with the move towards local computing, but with the lack of controls over local computing operations, and more importantly, the

implications for audit. Even as the audit team worked, regions had become aware of a growing need for their auditors to have the capability to audit systems used or wholly contained on SBCs.

At a recent conference, the implications for auditing SBCs was raised in a discussion paper.

It proposed that SBCs present certain control problems. Firstly, they are usually operated by a small staff, often within the user department, and usually in insecure locations. Secondly, the method of processing has inherent weaknesses, particularly where most of the input is entered from an on-line terminal device, where most of the input is entered by user department staff on terminal devices in user areas and where most of the data files can be accessed for enquiry and direct update.

In these cases, the most significant weakness is the lack of an adequate segregation of duties. Often the systems analysis, design and programming maintenance of system software and operations are carried out by one or two individuals.

The potential weaknesses may be compounded by the lack of controls in the operating systems and application programs which could help monitor system use, help assure data integrity and accuracy, and help protect data files. *By simply turning on the system and using a terminal may place the complete records and systems of the user at risk with no record of systems usage.* A knowledgeable user could well modify, delete or copy data or programs with readily-accessible computer programs.

So the main objectives of operating and programming controls are to ensure that only complete, accurate and authorised data is processed; to prevent or detect accidental errors or fraudulent use of data; to ensure that management or audit staff can trace progress, and to provide security against accidental record destruction and ensure continuous operations.

As well as identifying those controls considered necessary for SBC installations, the conference paper suggested a training programme for auditors which would provide them with the know-how to undertake reviews of SBC systems and their procedures.

Internal Audit Division has for many years designed and run its own training courses in an attempt, not merely to improve the quality of audits, but also to ensure that auditors can cope with the changes (particularly those of an accounting or financial nature) which were occurring within the business.

It has long been accepted in the accounting profession that the specialist nature of audit demands specialist training from practising auditors and accountants. It was therefore decided to design and run a course for internal auditors who need a working knowledge of SBC operations and who need to develop the associated techniques. Course objectives were sixfold:

★ A general appreciation of computer systems.
★ An awareness of the potential of computer systems, in particular of SBCs.
★ A detailed knowledge of CP/M, and an outline of BASIC programming.
★ An awareness of the type of controls required in an SBC environment.
★ An audit methodology for SBCs.
★ An appreciation of the future of computing in British Telecom.

Although DPE run a number of courses on computer appreciation, programming and systems design, this new course was specially designed and structured into five modules. The first, on computer concepts, aimed to give an outline of the major aspects of computer systems, particularly SBCs, including hardware, software, programming, program documentation and design techniques.

The second dealt with the control program for micros (CP/M), the major operating system used by most SBCs in British Telecom. This included micro-architecture, peripherals, file organisation, commands, text-editing facilities, programming, packages, and housekeeping.

The third module was an introduction to programming through BASIC, the most common SBC language. The next looked at SBC audit and was an appreciation of computer audit with particular relevance to SBCs, the need for controls, and an outline audit approach to SBCs including a review checklist and use of audit software. Finally, there was an in-depth look at the future of computing in British Telecom. Three speakers gave their personal views on three different aspects of computing in the business – multi-task zone centres, area computing, and local office networks.

The course was residential and lasted two weeks. Thirty students were divided into six syndicates, each with its own tutor. Emphasis was placed on practical work, and indeed, the course may have been unique in assembling the largest number of SBCs – 16 – ever brought together for a training course.

With two more courses scheduled this year it is hoped that all regional audit teams will now be able to tackle an audit of SBC-based projects, thus ensuring that British Telecom, not only takes full advantage of this exciting new technology, but does so in a fully controlled way.

Typical SBC projects for telephone areas

★ Blackspot – telephone service fault analysis
★ Circuit provision control – job progressing
★ Computer assistance to external works control
★ Computerised collection and production of manpower data
★ Exchange planning
★ Network master plan
★ Network surveillance
★ PABX maintenance
★ Repair service centre operations
★ Stock control of area stationery stores
★ TXE4 exchange line distribution and number allocation
★ TXK3 fault analysis
★ Vehicle utilisation

What can go wrong

Some of the problems that can occur when using minicomputers

★ Improperly deciding that a minicomputer is the correct tool for the application
★ Selecting the wrong minicomputer for the application
★ Inadequate training
★ Non-working programs – application and system software bugs
★ Receiving a 'lemon' system that still does not work reliably after the three-month settling-in period
★ Designing and building an inefficient system
★ Internal political resistance to the system
★ Poor guidance instructions
★ Poor error controls
★ System expands too fast – never stabilises
★ Complex data recovery procedures

Mr J. A. Foord is an audit manager in British Telecom Headquarters Audit Division.

Mr A. J. James is a group manager in the efficiency and audit section of the Data Processing Executive.

British Telecom Journal, Summer 1982

TAT-7 takes shape

D N Harper

The shore end of the TAT-7 cable system is brought ashore at Porthcurno near Lands End.

TAT-7, the latest £100 million Trans-Atlantic Telephone cable which will increase call capacity between Europe and North America by nearly 40 per cent, is due to become operational next summer. Land sections have already been laid and the ocean crossing is being carried out in six sections between now and March.

The first recognisable sign of the installation of TAT-7, the seventh in a series of cable systems between Europe and the USA, was the appearance at Porthcurno beach in Cornwall in April of Plymouth Area staff and local contractors moving in their heavy machinery. In a two day period under the supervision of British Telecom International (BTI) Marine Division's Beachmaster, a deep trench was dug between the beach joint manhole and the low water line to receive the new TAT-7 shore-end cable.

After identifying and marking the position of the nearby UK-Spain 3 cable and establishing radio contact between staff on the shore and BTI's cableship *Monarch* – anchored a third of a mile offshore – a towing line and the cable end were brought ashore from *Monarch* by a small launch using flotation bags to support the cable. The cable end was made secure in the beach manhole to be jointed onto the already installed land cable to Lands End terminal station.

The flotation bags were then removed and the cable was allowed to sink to the sea-bed. *Monarch* moved off to lay the remaining one and a half miles of cable followed by about a half mile of grappling rope.

The landing and laying of the shore-end cable at Porthcurno (and the equivalent operation at Tuckerton, New Jersey in July) was, of course, the culmination of a great amount of international negotiation and planning to which any new major communications highway must always be subjected.

A rolling estimate of circuit demand is constantly maintained and although about 50 per cent of this demand is currently met by satellite facilities – a policy to which BTI and many other administrations subscribe – the need for the provision of TAT-7 in 1981 was first recognised during construction of TAT-6 which was installed between the USA and France and brought into service in July 1976.

Up to and including the provision of TAT-6 all systems operated principally to the USA had been of the American Telephone and Telegraph Company's (AT&T) design although a significant proportion of the undersea cable used was of European manufacture. For TAT-7 BTI, or the Post Office as it was, offered a system of British design.

Because of the competitive situation, a committee structure including three working parties comprising British Telecom and AT&T representatives, each with specific terms of reference, was

set up in 1976 to arrange and operate the unique and complex tendering and adjudication procedures. The principal objectives were to prepare technical and commercial documents against which tenders could be invited, evolve an equitable adjudication procedure, adjudicate the tenders and make a recommendation on the letting of a contract.

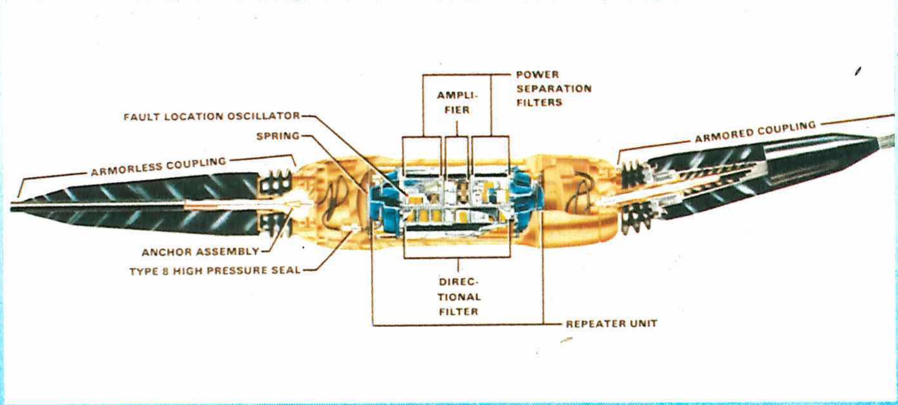
Because of the requirement for both AT&T and BTI to include in their respective bids cable manufactured in the other's country, and also in France, it was necessary to have a two-part tendering procedure: the first stage for cable only then for the complete system. Further, each system offer had to include costs for the other party's involvement – typically the costs at terminal stations – and all such inputs to the other's offer had to be agreed as 'fair and reasonable'.

Quotations from the suppliers were requested during 1977, but there followed long deliberations by the American governmental Federal Communications Commission (FCC) who eventually declared at the end of 1977 that TAT-7 was not required during 1981 since adequate satellite capacity, at more economical costs, was available to meet the circuit demand.

This statement was a major blow to those who had worked on the proposed project and early in 1978 potential European co-owners met as the Liaison Committee for Transatlantic Telecommunications (CLTA), under the auspices of the Committee of European Posts and Telegraphs (CEPT). They instructed its chairman to contest the FCC decision. In parallel with the European discussions, AT&T and the American International Record Carriers also met and AT&T forwarded a 'petition for reconsideration and request for oral presentation' to the FCC.

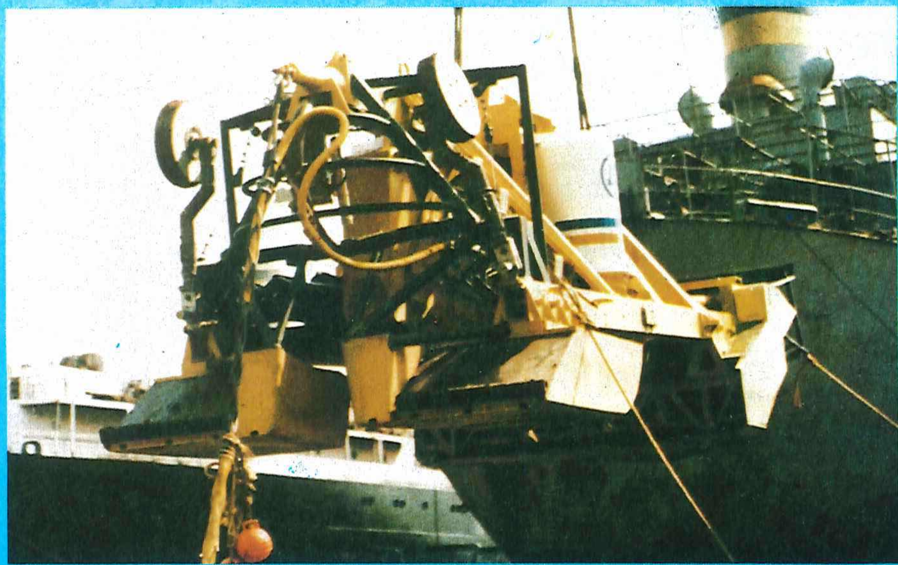
The submissions to the FCC contested the ability of COMSAT to provide the required transatlantic capacity within the necessary timescale, which to some extent was also dependent upon earth station facilities, and questioned the costings used in the satellite arguments against TAT-7. Further it was stated by both parties that the FCC had failed to

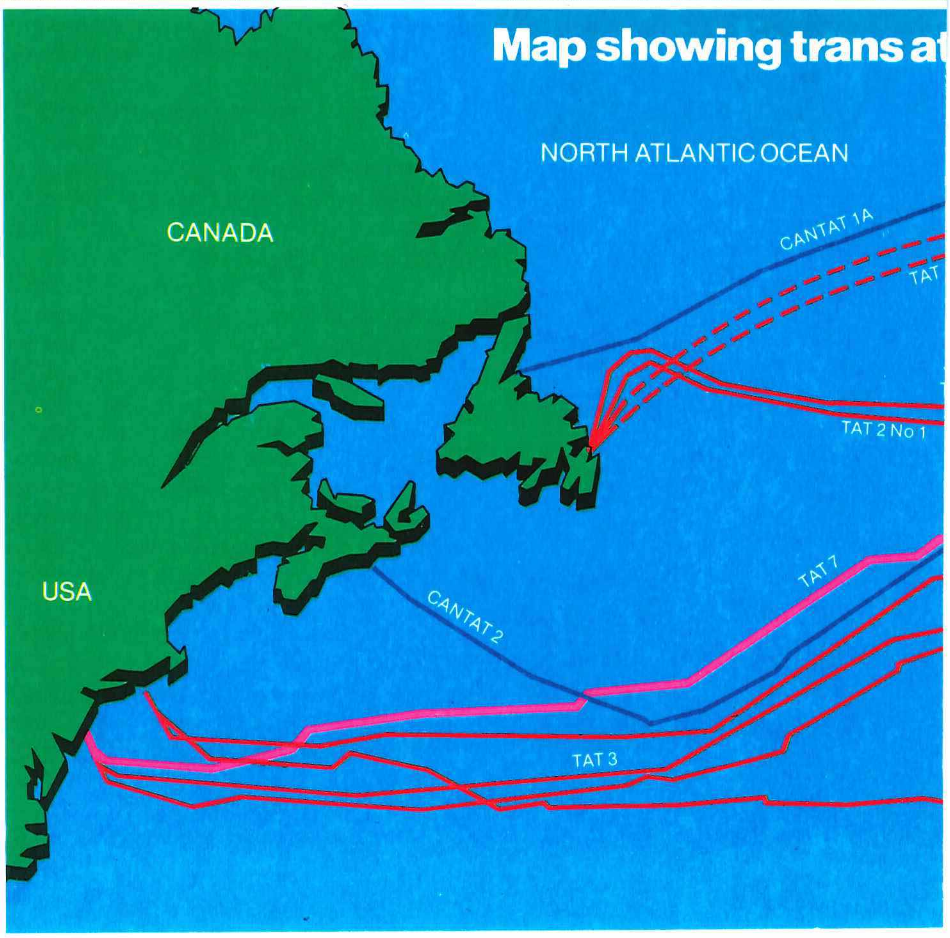
The TAT-7 cable system is jointly owned – 50 per cent by six North American carriers and 50 per cent by 19 European administrations. AT&T has a 39 per cent share and BTI, the largest owner on the European side, nearly 22 per cent. The total cost is currently estimated at about $197 million (£99 million) with STC supplying about £30 million worth of cable for the project.



The type of repeater used on the TAT-7 system.

Sea Plow IV – AT&T's submersible cable burying vehicle.





Summary of transatlantic cable systems

System	Terminal Stations	Cable length (Nautical miles)	Cable size (Inches)	Number of Repeaters	Number of 3kHz circuits	Completed	Cost (Millions)
TAT-1	Oban-Clarenville (Newf'd)	1945	0.62″	51	48	1956	$49.6
	Clarenville-Oban	1942	0.62″	51	48		
TAT-2	Penmarc'h (France)-Clarenville	2209	0.62″	57	48	1959	$42.7
	Clarenville-Penmarc'h	2194	0.62″	57	48		
CANTAT-1	Corner Brook (Newf'd)-Oban	2073	0.99″	90	80	1961	$19.3
TAT-3	Tuckerton-Widemouth	3518	1.00″	182	138	1963	$50.6
TAT-4	Tuckerton-St Hilaire de Riez	3599	1.00″	186	138	1965	$50.4
TAT-5	Green Hill-Conil (Spain)	3461	1.50″	361	845	1970	$79.0
CANTAT-2	Widemouth-Halifax	2805	1.47″	473	1840	1974	$70.5
TAT-6	Green Hill-St Hilaire de Riez	3396	1.70″	694	4190	1976	$197
TAT-7	Lands End-Tuckerton	3295	1.70″	662	4200	1983	$197

TAT-1 and TAT-2 both employed similar one-way repeatered cable systems for each direction of transmission, the repeaters were long, slim, articulated flexible units virtually built into the cable which was armoured throughout its length. (TAT-1 cable system was taken out of service in Nov. 1979). All other TAT systems and the CANTAT systems followed traditional principles employing a single cable (non-armoured or lightweight in deep water sections) and two-way repeaters in rigid housings. Cost of TAT-1 includes the transCanada submarine cable system and microwave link to the US border which are also used by TAT-2.

recognise the voice of administrations not under its jurisdiction.

Discussions between representatives of the TAT-7 co-owners and the FCC continued through most of 1978 when eventually the FCC indicated their agreement to TAT-7. Work was quickly underway again with suppliers quotations once more requested and the administrations costs exchanged and agreed. On exchange of complete systems costs the adjudication process was put into top gear.

After much careful study it appeared there was no clear winner. The American system had a lower capital cost but the British system offer, being of larger circuit capacity had a lower cost per circuit. A decision was made to recommend to the co-owners that the American system be bought for TAT-7. The formal order of approval of the FCC was issued in August 1979 and the Construction and Maintenance Agreement was signed by the 19 European and six North American co-owners soon afterwards. AT&T then placed the contracts with their respective suppliers.

The manufacturing industries were soon working at full speed. Western Electric's factory in New Jersey was producing the 677 submersible repeaters and the 24 submersible equalisers required for the system at a rate of about 18 per month. STC at Southampton is producing about 2,700 nautical miles of the cable (2,400 lightweight non-armoured type and more than 300 nautical miles of armoured cable), at a rate of about 100 miles per month.

The remaining lightweight undersea cable, approximately 690 nautical miles, is due to be manufactured by Les Cables de Lyon (CdL) in Calais later this year.

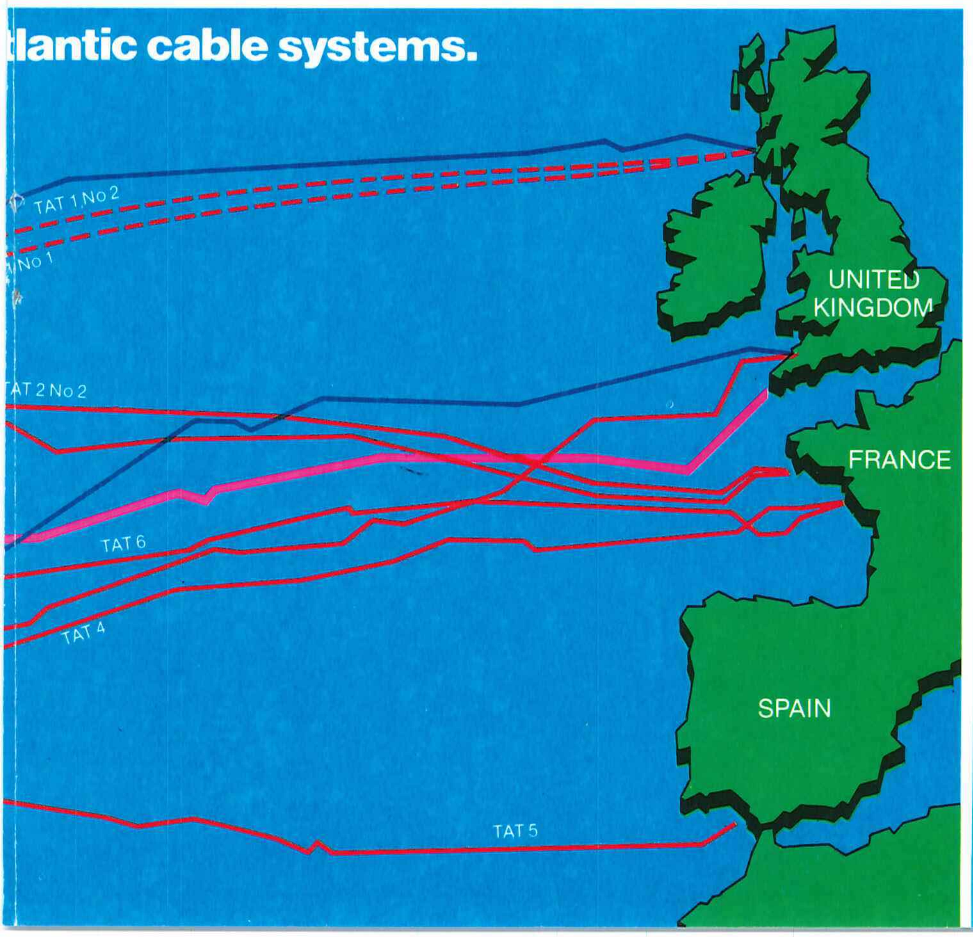
The power feeding equipment, required to energise the submerged repeaters, is being manufactured by Western Electric Company and the terminal transmission equipment is being produced by CIT-Alcatel in France.

Terminal equipment installations at Tuckerton are already underway and those at Lands End are due to start in September.

Local staff from Plymouth Telephone Area will operate and maintain the terminal station at Lands End – some two miles from Porthcurno – on a day-to-day basis for BTI and will monitor the installation of all terminal equipment during the next few months. To help familiarise local staff with the power feed and transmission terminal equipment, BTI's Submarine Cable Systems Division has arranged, through AT&T, two training courses at the respective manufacturers' locations. These courses are to be followed by further training exercises at Lands End during the latter stages of the system installation and commissioning.

Lands End, like many other repeater stations, was designed so that its plant should operate from the standard negative 50 volts battery supply. The TAT-7 power feed equipment, however, has been built to operate from AT&T's new standard repeater station power supply of positive 150 volts. This has meant special – 50 volts/+150 volts dc-dc converters being developed by Network Executive's Power Division and these are being installed this summer.

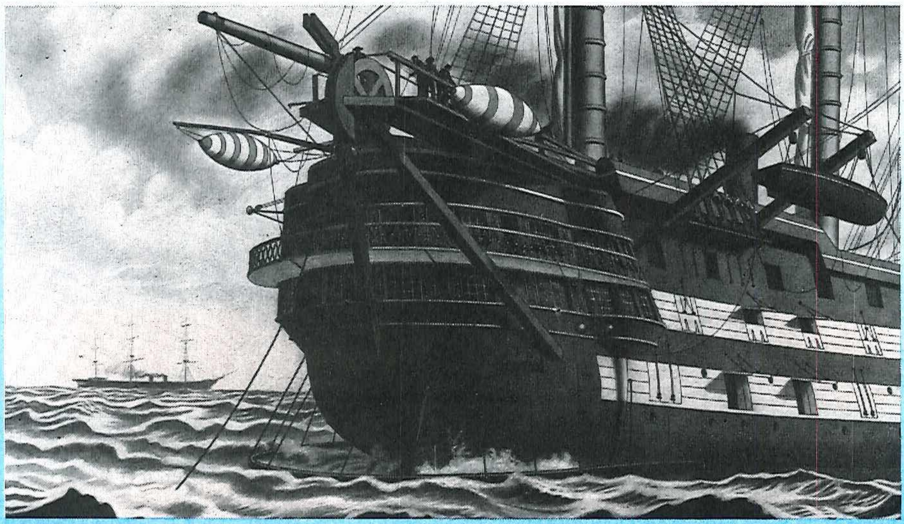
A further area of specialist activity has



been the collaboration of British Telecom Research Laboratories, Network Executive's Cable Jointing Laboratories and BTI Marine Divisions' own cable jointers in developing cable jointing methods for use between any two of three differing types of 1.7″ cable, the standard 1.7″ cable developed by British Telecom/STC for TAT-6 and two cost-reduced versions developed by STC and CdL.

From now on the project will gain impetus with the installation of cable and repeaters on the two continental shelves. This summer the French cable ship *N C Vercors* will load nearly 100 nautical miles of armoured cable, 20 repeaters and one equaliser at STC's cable factory at Southampton then sail to the USA to take on board AT&T's *Sea Plow IV,* a submersible vehicle for placing the cable and repeaters into the sea bed.

Following a few days trial with *Sea Plow, N C Vercors* will recover the end of the already laid shore-end cable off Tuckerton and joint onto it the end of the cable in her tanks. *Sea Plow IV* will then be lowered onto the sea bed with the cable threaded through it and *N C Vercors* will sail into the Atlantic towing the plough which will create a deep furrow in the sea bed to receive the cable and the repeaters jointed in at about 5.1 nautical mile intervals.



How it used to be – *HMS Agamemnon* laying the first Atlantic cable in 1858.

On reaching the end of the cable at the edge of the continental shelf, nearly 100 miles off-shore, a grappling rope will be attached to the cable and streamed. *N C Vercors* will then return to Southampton with *Sea Plow IV* to be loaded with about 180 nautical miles of armoured cable, 36 repeaters and one equalizer for laying on the UK shelf.

It is intended that as soon as practicable after each of the ploughed lays, that the cable route be examined by the Submersible Craft Aiding Recovery and Burial (SCARAB) in all areas where, from observations of towing tensions during the ploughing operations and other data, burial of the cable and/or repeaters is suspect. The ploughing operations together with any remedial work carried out by SCARAB should ensure that the cable and its repeaters are not in danger from the trawls of the fishing fleets.

In September the American cable ship *Long Lines* is due at STC, Southampton to take on board the first of three loads each of about 770 nautical miles of lightweight cable. With about 155 repeaters and five equalisers jointed in on board, each load when laid in an easterly direction (USA to UK) will narrow the gap between Tuckerton and Lands End. The fourth load of about 690 nautical miles of lightweight cable from CdL with its 139 repeaters and five equalisers will be laid in early next year to complete the connection between the two terminal stations.

The laying of about 3,300 nautical miles of cable by *N C Vercors* and *C S Long Lines* along a route surveyed during 1980 by BTI cableship *Alert* of nearly 3,200 nautical miles between the two terminal stations, calls for the same high degree of accuracy of navigation as was used by the survey ship. To carry out any required future repair operations the exact line of the cable and the location of every repeater must be determined and logged. The excess of cable miles over route miles is laid as slack enabling the cable to follow the undulations of the seabed and either settle on, or be ploughed into it.

During the laying operations BTI staff from the Marine Division and the Submarine Cable Systems Division will join in the work of AT&T's laying and transmission teams both on board the cable ships and at the terminal stations. The final splice in the undersea cable on the edge of the UK shelf (about 180 miles from Porthcurno) is planned for next year.

Following the completion of the cable lays and installation of the terminal equipment, the work of setting up, adjusting for optimum performance and testing of the overall system will begin. This will take about a month and will be followed by a few days collecting all the required maintenance data and noting the terminal equipment settings.

Future maintenance of any cable system is very much dependent upon having accurate data from the start and changes as small as a fraction of a decibel are investigated.

Mr D. N. Harper is a head of group in BTI's Submarine Cables and Microwave Systems Division and is responsible for co-ordinating the planning of oceanic submarine cable systems.

British Telecom Journal, Summer 1982

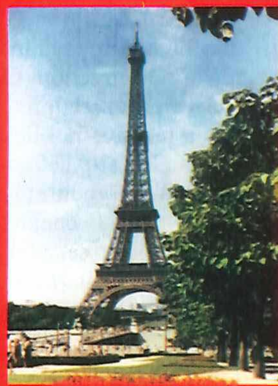
TAT 8

With the installation of TAT-7 only just started and the system not due in service until next summer, the European and North American administrations already see the need for a future cable system to be in service by 1988. This will be TAT-8.

It is expected that the system will employ optical fibres operating at 280 Mbit/s and may have multiple landings on each side of the Atlantic. Tenders to provide the system will be invited from three countries – America, France and Great Britain.

The basis of procurement will follow that of TAT-7. Current plans call for invitations to tender to be issued in December for bids to be returned by next March and adjudication, which includes a detailed examination of the circuit requirements between various areas, is expected to be completed next July – overall a much shorter time scale than for TAT-7.



French Revolution


This, the tenth in our series on overseas administrations looks at the remarkable progress made by France over the last few years.

Ten years ago the popular joke in Paris was that it took a year and a half to get a phone and an hour and a half to get the dial tone. Another bottle of Bordeaux later, however, and often the laughter would turn to frustration as a vital call to a distant wife to warn of a late home coming would fail yet again.

The humour was ironic but not over-exaggerated, for France at that time had a network of just five million connections – half the size of the UK system of the time, with long waiting lists and poor service. In a country with a population similar to the UK's and roughly twice the size, this meant that only businesses and a few better off private households had access to the telephone.

Even as recently as the mid-1970s, the quality of the French telephone network lagged far behind that of other major industrialised countries in Western Europe. During the past six years, however, French telecommunications have changed, to an extent which still surprises administrations in other countries, and which has brought France to the forefront of modern information technology. Two-thirds of the population now have direct access to a telephone, and developments in telex, facsimile and viewdata have been sufficiently fast to put France on a par with leading telecommunications administrations in Western Europe.

Such progress, by any measure, is incredible, and was brought about in 1976 by the French Government declaring it a national priority to modernise and expand the domestic network and to establish a secure telecommunications manufacturing base to compete in the world market place. Objectives for the industry were included in a five-year plan launched by President Giscard d'Estaing. These were to give the entire population access to the telephone, to reduce regional and socio-economic inequalities, to promote regional development and to guarantee regular industrial production, in particular to develop electronic switching where already the manufacturers were well advanced.

Superficially, from a UK viewpoint, it all seemed relatively straightforward, and the French administration needed only to make telephone and other services available to fulfil a natural latent demand in the business and domestic communities. But the critical difference was

that having got along without a telephone for so long, most people were unaware of the benefits, both social and economic, to be gained from a modern telecommunications system.

The 'Direction Generale des Telecommunications' (DGT) is headed by a Director-General who reports to the Minister of State for Posts, Telecommunications and 'Telediffusion' with 22 regions – Directions Regionales des Telecommunications, (DRT) – which may be sub-divided into operational subregions – Directions Operationnelles des Telecommunications (DOT). In what was a massive public relations exercise, the DGT set up 150 commercial agencies and 300 'Teleboutiques' to provide community level contact, answering enquiries about services, tariffs and local planning. That the exercise worked, is testified to by the growth from 6.2 million connections at the beginning of 1975 to a projected 20 million by the end of this year with two-thirds of the population now with direct access to a phone.

The DGT has a network monopoly but supplies only the initial handset with a line, and competes with other suppliers for extension telephones. The French administration used Teleboutiques to promote their own wares in much the same way as British Telecom has developed telephone shops, to cope with the post-monopoly situation. A modern telecommunications system, however, consists of more than telephones, and so far, more than £15 billion has been invested in system growth and modernisation. It is well known that telecommunications requires heavy capital investment in equipment and ongoing research and development, and the small network of 1975 could not possibly finance the sort of growth projected by the five-year plan itself. Three main methods of short and medium term finance were set up to see the DGT through the dislocative growth period with an aim to saturate basic demand and therefore enable the administration to become self-financing by 1983.

Many French tariffs are higher than the UK's and French subscribers do not have the benefit of significant cheap rate reductions. Nor is there a difference between business and residential charges which means that a French residential subscriber will often pay more than his UK counterpart. Local calls are untimed and charged at slightly more than 5p, but local call areas are generally only half the size of those in the UK. Cheap rate periods run from 7.30 pm to 8 am Monday to Friday, 2 pm on Saturdays and all day on Sundays and Bank Holidays. Telex calls, however, are among the most costly in Europe.

Paradoxically, service equipment has benefitted from the slow telecommunications development. Whereas British Telecom was forced to make speculative choices about the type of equipment to install in the 1950s and 1960s to meet increasing demand, the French system was able to avoid these choices. This means that 85 per cent of equipment is less than ten years old and more than half of that is under five years old. About eight out of ten exchanges are crossbar, but there is a commitment to replacing these with electronic exchanges during the 1980s and eventually to have a totally digital system linked by optical fibre cables.

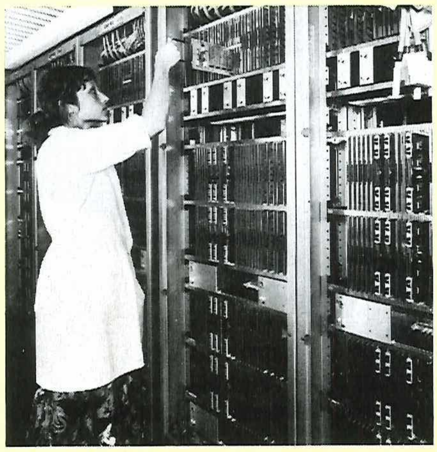
The telex service is also well advanced with more than 90,000 connections – about the same as in the UK. Electronic machines were introduced in 1980, which improved customer interest in telex facilities, although the number of calls last year lagged behind the number made in the UK by some 30 per cent.

Research and development is undertaken within DGT by the National Telecommunications Research Centre, although product development is primarily the responsibility of the French manufacturers. Reliable equipment supply was vital to the success of the growth programme, and three main sources were available: CIT Alcatel, Thomson-CSF and CGCT (a subsidiary of ITT).

CIT Alcatel produces a series of digital switches claimed to be the most widely sold system in the world with 1.2 million lines in operation and two million on order. To provide a stimulative competitor for Alcatel, in 1976 the government organised subsidiaries of L M Ericsson and ITT in Thomson-CSF and this company has produced a rival series. CGCT has won major contracts with its own system but does not supply the DGT.

Another advantage of latter day network growth for the French has been a clear

An engineer at a roadside cabinet connects a subscriber's line to the local telephone exchange.



A technician inserts a printed circuit board at an electronic exchange.

See-through telephone kiosks are a feature of the Paris street scene.

run at a national numbering scheme, currently planned as a nine-digit number, based on a one-digit trunk code and an eight-digit local number. The new scheme – the first update since 1955 – allows in the final phase for metropolitan France to be divided into five primary trunk zones as against the current 72, and inter-zone calls prefixed with '0'.

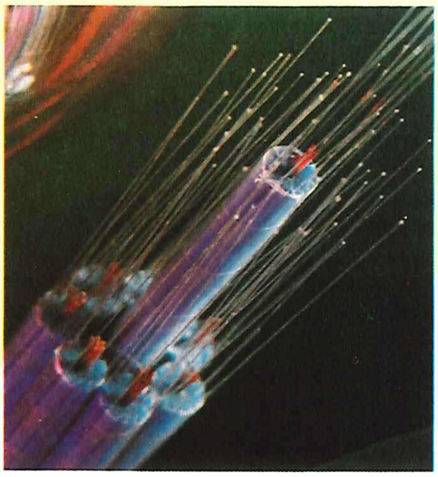
By 1985 it is hoped to have set up two zones, 'Paris' and 'outside Paris' as an intermediate measure. The electronic exchanges will be able to cope with the changes easily, but crossbar exchanges will need modification which at the same time will also enable introduction of keyboard sets, abbreviated dialling and itemised billing.

With the growth in the network, quality of service has been a vital issue in attracting customers by projecting, via the agencies and teleboutiques, an automated well-managed service which meets the needs of the individual. Obviously, a problem associated with accelerated growth is a danger of deterioration in service quality, but the DGT has achieved highly respectable figures although provision of telephone service times still lag behind those of the UK.

Percentages of successful calls, both local and STD, are similar to those in this country and both fault reports and percentage of faults cleared by the end of the next working day are better in France. But this, of course, is a corollary of the largely new network.

Services offered by the DGT are similar to those of British Telecom, but they are almost invariably behind the UK in implementation as most services are still experimental in France. These services include: Telealarm – an aid to the elderly providing an easily tripped alarm for use in emergencies; Telefax – a facsimile service launched in 1978 producing copies in three minutes; Radiopaging – known as Eurosignal available countrywide, as are radio telephones, operating on the 150, 400 and 900 MHz bands and Teletel – similar to British Telecom's Prestel, on test in the Paris area since 1980. Main Teletel services are tourist information, bank transfers, a document transmission service for internal and international trading, mail order shopping, citizens rights, bank statements and messages.

The DGT had planned to replace all paper directories by an electronic directory terminal to be introduced progressively from last year and installed in all subscribers' homes, free of charge, by 1995, at a current cost to the administration of less than £100 per terminal. The subscriber would simply key in the name and address of the person he wishes to contact and the required number is displayed on the screen. These plans have since been modified to give subscribers the option of paper directories.



Optical fibres will be playing a vital role in the future of French telecommunications.

A range of business conference services is also being developed. Conference Call allows more than two people to join a conversation at specified times, and the Audiographic conference extends this by allowing up to four people to hear each other via the analogue network and also to see a display of graphics entered on a television screen, although this entails being in a town which has a properly-equipped studio.

Videoconference, the next step up, has been available between Paris, Nantes, Rennes and Lyon since 1980. Operator services are less extensive than those in the UK and cover emergency services, fault reports, directory enquiries and operator assistance, as well as Freefone and credit card facilities.

In future, all exchange equipment orders will be for time-division switching equipment only, with a view to phasing out semi-electronic support in the next five to ten years. Digital transmission is already available on some exchanges and the plan is to expand the digital system as quickly as possible to make best use of the enormous potential of satellites.

France is already the third largest user of Intelsat, after the USA and UK, using ten earth stations in France and in French territories overseas. Digital transmissions have been tested using the Franco-German 'Symphonie' satellites and OTS, the European test satellite. To meet further domestic requirements, particularly for business and government use, France will be launching its own satellites next year in a scheme known as Telecom 1. Two satellites in geostationary orbit above the Gulf of Guinea in the Atlantic Ocean will carry communications in the 12 and 14 GHz frequency bands, with a gross capacity of 150Mbit/s and a 20W transmitting power, covering France and Corsica.

Operating capacity will be assigned to each station via a central station, and temporary links will be possible using mobile dishes. Intracompany services will include cheap videoconferences, high-speed facsimile and computer file transfers. And in Biarritz thousands of local subscribers will soon be provided with interactive video transmission and high fidelity music programmes via optical fibre cables on a field trial basis. One of the aims of the experiment is to assess the effect of satellite facilities on domestic customers.

The viewdata, facsimile and other services at present on test will be expanded to national use within five years. Research into uses of silicon microelectronics and optical fibres is being undertaken at the National Telecom Research Centre – similar to British Telecom's Research Laboratories – and the manufacturers are continuing their development work.

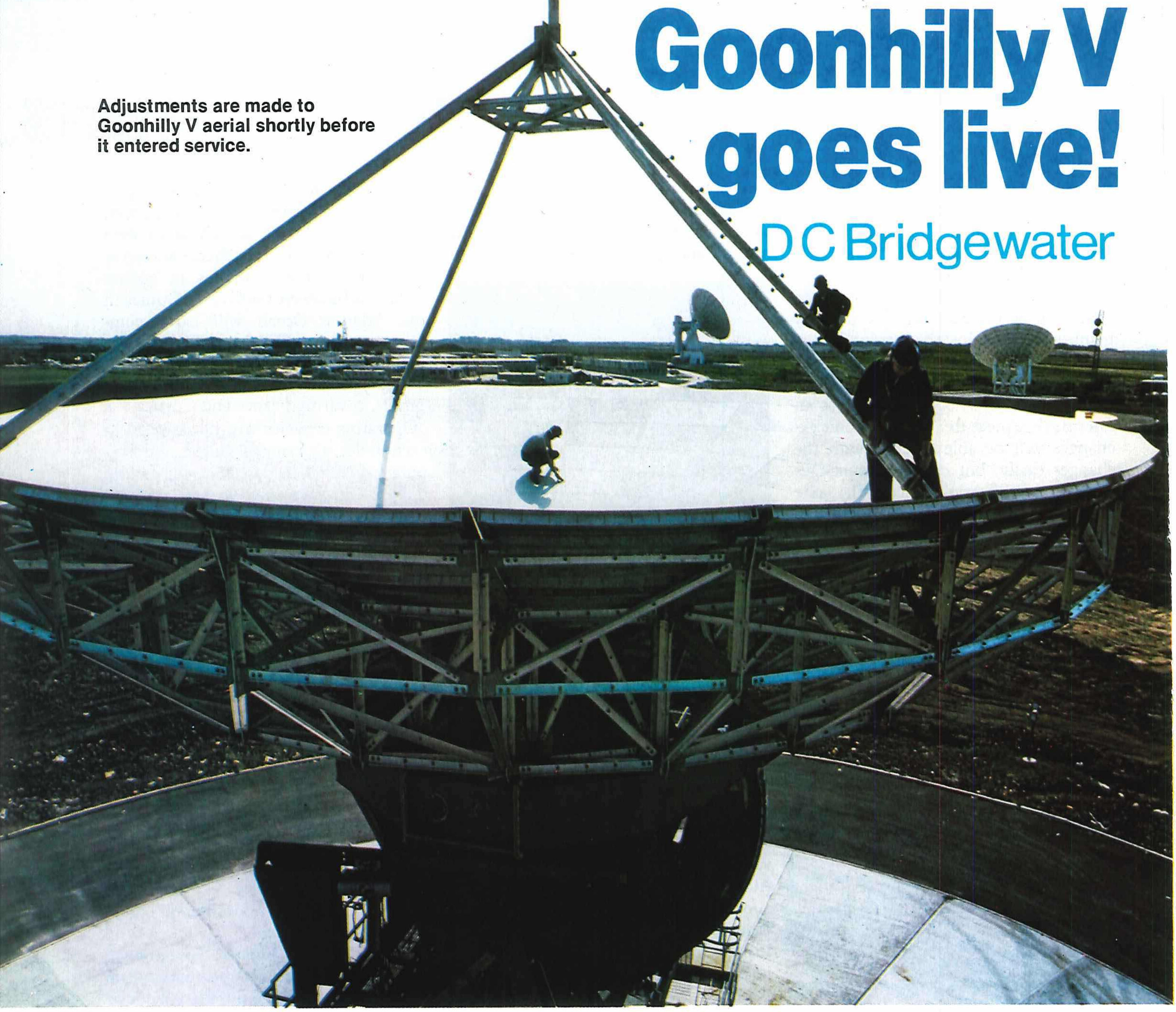
The DGT, the French Government and the telecommunications equipment manufacturers have combined to achieve remarkable success in expanding and modernising the network over the last ten years. The effect on the French economy has been beneficial, with trade and particularly exports greatly improved, even allowing for the world recession during this period. The French have come from well behind to catch up with the front runners in Europe, and now intend to improve and develop so that wherever French telecommunications are in another ten years, the probability is that the world will know about it!

The authors – **Mr P. H. Dabbs, Mr J. J. E. Swaffield, Ms C. M. C. Aust** and **Mr I. Sarwar** – are all members of the international comparisons group in the Service and Performance Department of BTHQ.
They acknowledge the help of SIRP-PTT and **M. H. Longequeue** of the Direction Generale des Télécommunications (DGT).

British Telecom Journal, Summer 1982

Goonhilly V goes live!

D C Bridgewater



Adjustments are made to Goonhilly V aerial shortly before it entered service.

The recent launch of Inmarsat's new global satellite system providing communications between ships at sea and the shore took place shortly before the inauguration of British Telecom's first coast earth station at Goonhilly in Cornwall. This article looks at the new terminal – Goonhilly V – which will operate to the Inmarsat system.

The present Inmarsat system (see *British Telecom Journal*, Spring 1982) comprises three satellites, one over each of the major ocean areas of the world, with the new Goonhilly terminal operating to the Atlantic Ocean area satellite. Each ocean area has a number of coast earth stations (CESs), which can communicate with any ship within the coverage area of the satellite provided that the ship is equipped with a ship's terminal.

Each ship must have a one-metre diameter steerable antenna and signalling, receiving and transmitting equipment approved by Inmarsat. Interconnection of the CES and ships in each ocean area is controlled by one master CES called the network control station (NCS). The NCS for the Atlantic Ocean area is at Southbury in the United States.

International frequency agreements require that ships operate at 1.5 GHz/1.6 GHz (L Band) and that the CES operate at 4 GHz/6 GHz (C Band). In the ship-to-shore direction, a signal transmitted by a ship at 1.6 GHz is received by the satellite, frequency translated, and retransmitted to a CES at 4 GHz. Similarly in the shore-to-ship direction, a signal transmitted by a CES at 6 GHz is received by a ship at 1.5 GHz after satellite frequency translation.

Because of the frequency translation which occurs in the satellite, a CES must also operate at the ship's frequencies when it is required to communicate with another CES or the NCS. Communications with other CESs and NCS is required for order wire facilities, reception of satellite communication channel assignments from the NCS and for transmission and reception of automatic frequency compensation (AFC) pilot signals.

The available satellite bandwidth is divided into 299 channels spaced at 25

KHz intervals. Some of these are allocated for telephony using analogue narrow band frequency modulation and the remainder are allocated for telex and signalling using digital time division multiplex (TDM) and time division multiple access (TDMA).

The aerial system at Goonhilly consists of a steerable antenna, radio frequency (RF) equipment and access control and signalling equipment (ACSE) all with appropriate controls and supervisories. A block diagram of the terminal is shown here. The function of the ACSE is to provide call set up and switching and processing facilities; it is connected at an intermediate frequency of 70 MHz with the RF equipment which provides amplification and frequency translation between the intermediate and satellite frequencies.

To ensure a high availability for the system, fully duplicated chains of equipment are provided with automatic changeover to the standby chain in the event of a failure of the working chain. The system is designed to be available for 99.98 per cent of the time. Control and supervisory equipment is provided locally at each equipment location and also remotely at a central console in the main station control room.

The antenna is a cassegrain configuration with a 14.2 m diameter parabolic-shaped main reflector, a hyperbolic-shaped sub-reflector mounted at the focus of the main reflector and a corrugated horn feed. An azimuth bearing mounted on top of a steel cone tower supports a rotating yoke which holds the two high-level elevation bearings.

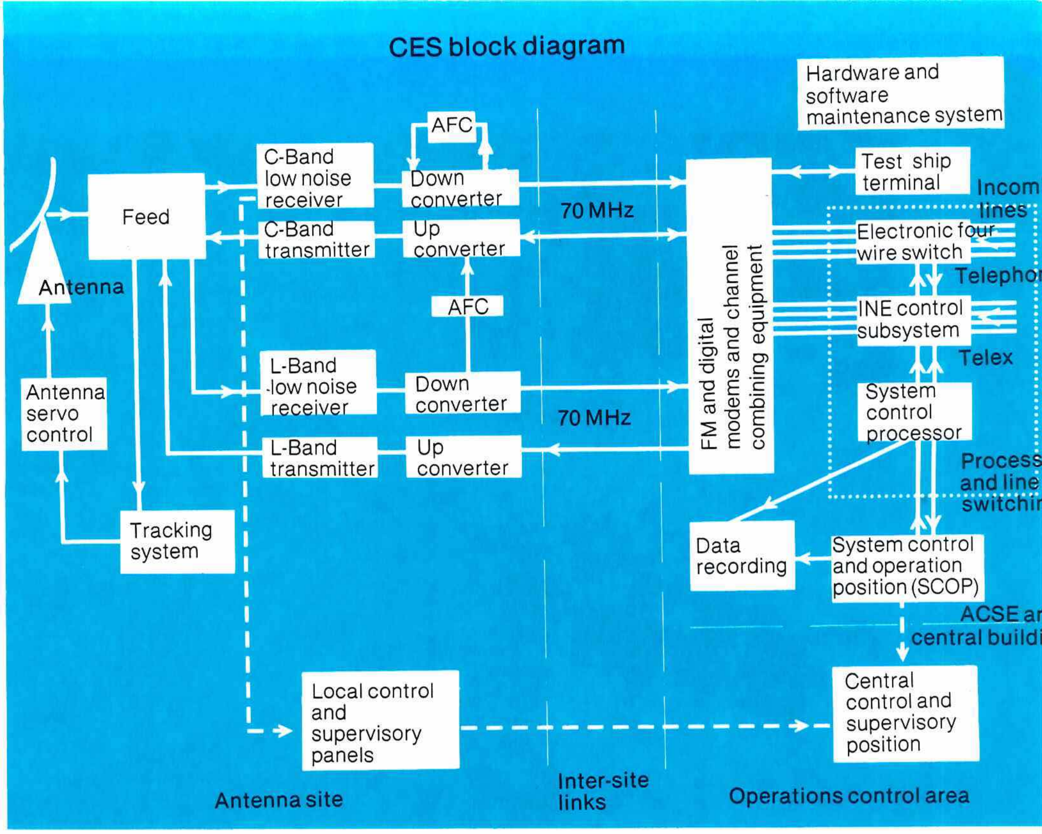
To minimise maintenance and planned out-of-service periods during the 20 year design life of the aerial, aluminium, with stainless steel fixings, has been used for the whole of the main reflector and sub-reflector. The antenna is unusual in that it is required to operate in the two frequency bands, 1.5 GHz/1.6 GHz and 4 GHz/6GHz.

The antenna tracking system is controlled by a microprocessor-operated antenna control unit which selects the tracking mode required, gives visual readouts of pointing data and can also be used to store tracking information. Automatic tracking of a satellite beacon is provided by the monopulse tracking system but the aerial may also be steered under manual control by an operator if necessary.

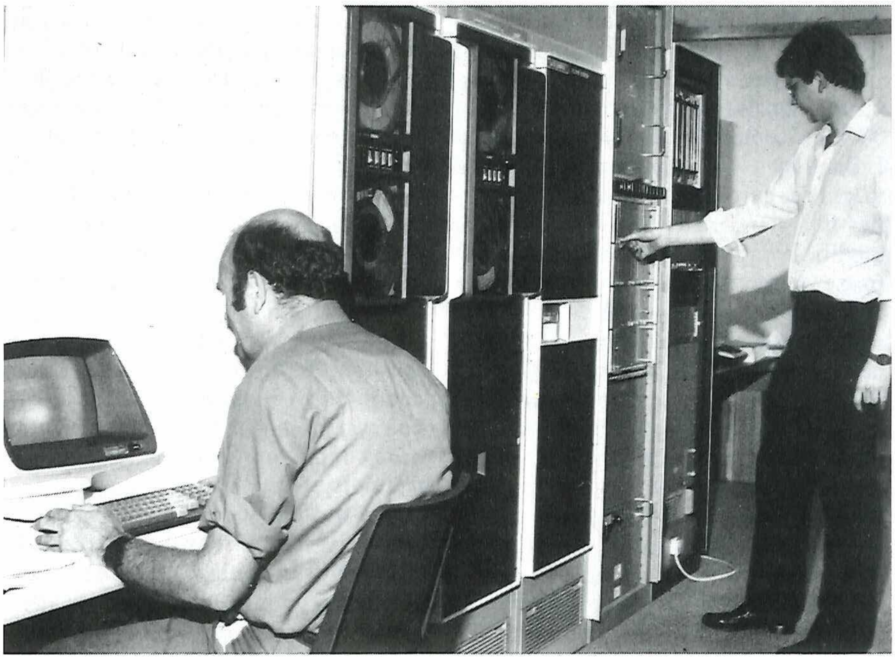
The monopulse mode relies on the fact that a signal arriving at the antenna at an angle to the main axis generates spurious signals which may be detected to determine the degree of pointing error and used to steer the aerial until its axis is aligned with the received signal. Drives in each axis of the antenna, elevation and azimuth, are by two 7.5 kW dc motors controlled from a servo drive cabinet and operating in counter torque to minimise the effect of backlash in the gears. Should one motor fail, the second motor is still able to drive the antenna but with reduced tracking accuracy. As a back up to the dc motors there is a small auxiliary ac motor in each axis.

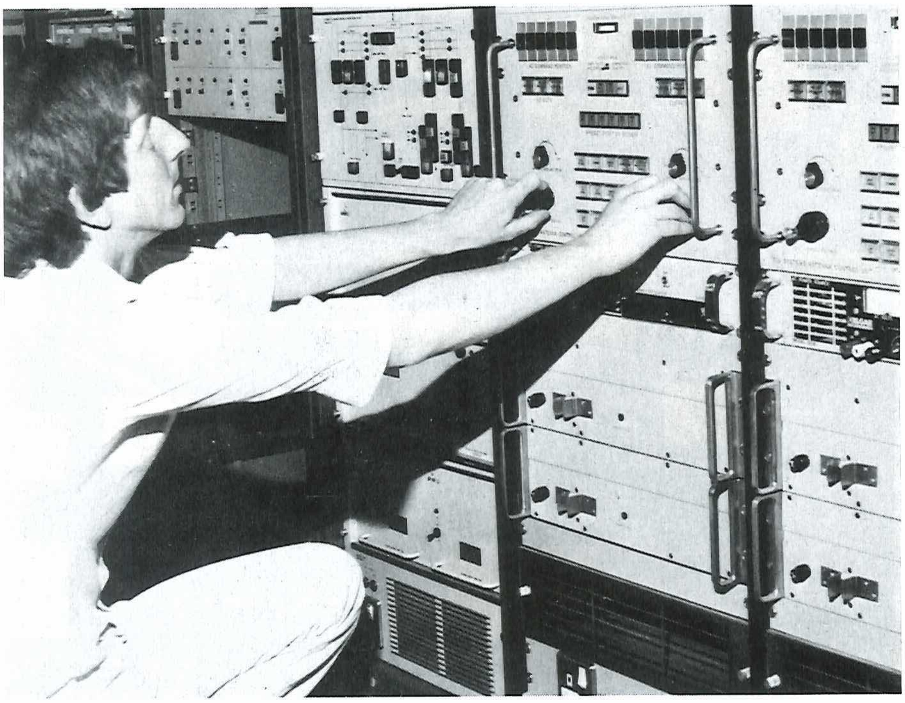
Adjacent to the antenna is the aerial building which houses the RF equipment. The purpose of the RF equipment is to convert the transmit 70 MHz signals from the ACSE to either 1.6 GHz or 6 GHz as required, and to amplify and then feed them to the antenna for transmission to the satellite. Signals received from the satellite are at 1.5 GHz and 4 GHz, and are split at the receive ports of the antenna feed and then amplified and converted to 70 MHz by the RF equipment before being fed cross-site to the ACSE. The upconverters and downconverters are standard earth station equipment with additional facilities for automatic frequency compensation (AFC).

The AFC is required to compensate for the effects of satellite frequency translation errors and frequency shifts and so



Clerk of works Dick Roynan (left) checks the status of the NCS simulator on the maintenance system which is part of the ACSE equipment being installed at Goonhilly.





Goonhilly V aerial can be manually steered when necessary.

maintain the correct frequency into the receive equipment which can tolerate only small frequency errors. The AFC is achieved by transmitting and receiving two AFC pilots via the satellite. One pilot transmitted at C Band is received at L Band and is compared with a reference frequency.

Any error in the received pilot frequency is then used to operate a voltage controlled crystal oscillator in the C Band upconverter chain and in this way the transmit frequency is adjusted until the received frequency is correct. The second pilot, transmitted at L Band and received at C Band, is used in a similar way to correct the frequency of the C Band received signals. The Inmarsat mandatory requirement is that the AFC system maintains the received signals within 230 Hz of specified frequencies.

High-power amplification of the transmitted signals is provided at C Band by a 3 kW air-cooled klystron amplifier and at L Band by a 200 W air-cooled travelling wave tube amplifier. The klystron amplifier is a standard transmitter with two modifications designed to improve the phase noise performance which is a critical factor affecting the bit error rate of the low-speed data. The amplifier has been modified by converting the klystron filament supply from ac to dc operation and a ripple regulator has been provided in the high tension (HT) power supply which removes any residual mains-induced ripple on the supply to the klystron. Amplification of the received signals is provided at C Band by a parametric, Peltier-cooled, low-noise amplifier located in an equipment room at the rear of antenna feed and at L Band by a special amplifier.

From the aerial site all cross-site coaxial links are at a common intermediate frequency of 70 MHz to the ACSE which is located in a wing of the central building. Two requirements of the Inmarsat system are that ships terminals should be simple to operate and cheap to install, thus making them attractive to the owners and that the system should be managed by a NCS.

To meet these requirements, the ACSE is a complex computer and processor-controlled system, the main functions of which are signalling to ships' terminals and the NCS for the setting up of telephony or telex calls, connection of the call between the inland network and the satellite, data recording for billing and maintenance purposes and voice and telex order-wire facilities. Currently the ACSE has capacity for the simultaneous transmission and reception of 13 telephony channels and 21 telex channels with provision for future expansion. The ACSE also has a direct link to the Maritime Rescue Co-ordination Centre at Falmouth which provides a distress service for ships.

The processors and line switching, shown in the diagram, consists of a minicomputer (the system control processor) and two groups of microprocessors. One group of microprocessors – the line control subsystem – performs the telex switching and the second group called the electronic four wire switch performs the telephony switching. The minicomputer accepts incoming call instructions, determines the action required and instructs the microprocessors to deal with calls as they come in.

The minicomputer software also contains self-diagnostic routines which provide a print out of any faults.

A good illustration of the operation of the ACSE is provided by an example of a ship-to-shore telephone call. A ship wishing to make a call will transmit on a request channel to a particular CES and will specify the type of channel required, in this case telephony. All CESs continuously monitor the ship's request channel but only the addressed CES will respond to the request. The response of the CES will be to transmit a 'request for assignment' message to the NCS. On receipt of this request, the NCS will allocate an available satellite channel for the call and transmit this information to the CES and the ship.

The CES and the ship will then tune to the allocated channel and all further signalling will be in band with the ACSE switching the satellite channel through to the national network via an international switching centre. Having set up the call the ACSE will record call data for billing purposes. On completion of the call the CES will transmit a 'notification of ship clearing' message to the NCS which will then make the channel available for other users. The set-up of a telex call differs slightly in that the ACSE allocates a channel on its own TDM carrier and informs the ship via the NCS.

In May this year there were 1,160 ships equipped to operate in the Inmarsat system out of a potential world fleet of 70,000. Although the ships' terminals are more expensive to install than the HF equipment they replace, they are proving to be an attractive proposition to ship owners and operators because of the reliable 24-hour global communications service they provide, and the number of suitably-equipped ships is expected to grow rapidly in the future.

Future developments will include an extension of the range of services offered so that ships have all the telecommunications facilities available on land. Other ideas are to extend the services to offshore oil and gas installations and perhaps aircraft. One thing seems certain, the potential for growth of the present system and the ideas for further developments seem to offer the CES at Goonhilly a secure future.

Mr D. C. Bridgewater is an executive engineer in the Earth Station Planning and Provision Division of British Telecom International's Network Department.

British Telecom Journal, Summer 1982

The economics of repair

I A Niven

Like an army is supposed to march on its stomach, so it could be said that British Telecom's efficiency depends on the quality of its engineering equipment. And because this quality must always be of the highest order, a cost-effective check system has been developed which determines whether a particular item needs repairing, servicing or refurbishing.

When any engineering equipment is returned to a supplies depot either as faulty or as no longer required, it is monitored by a group of engineers within British Telecom's Central Services Materials Department. One of the functions of this duty is to advise provisioning or sponsoring groups whether a newly-introduced item can be refurbished for re-use at the end of its life in a particular situation. If so, the item would be designated 'R' in the vocabulary of engineering stores and telephone areas throughout the country would be allowed credit for returning it in reasonable condition.

But perhaps, first it would be useful to set out exactly what is meant by the terms repair, servicing and refurbishment. Repair of a faulty item is undertaken either by the manufacturer, area repair centre or British Telecom factories with the repaired item or a pool stock replacement being returned to the sender. Servicing is almost the same except that like a car needs regular servicing to prevent faults developing, an item need not be malfunctioning to require servicing. Refurbishing means completely overhauling equipment in an attempt to restore it as far as possible to its original condition.

When such a process has been set up to deal with second-hand equipment recovered from the field, it is often more economical to refurbish faulty items in the same process rather than repair on an individual basis. In fact all equipment recovered as 'R' to Materials Department is refurbished.

When any item is easily renewable, the refurbishment cost plus all other ancillary costs must prove to be lower than the cost of new to warrant 'R' status. The repair or refurbishment costs are ultimately determined by the contents of the repair specification which specifies the extent of work and the standard required of the refurbished item. In deciding the extent of refurbishment and final performance of an item, the specification writer must decide on how close to new the completed item should be.

This decision is governed by his knowledge of the use of the item in the field and an awareness of the maintenance liability that a reduced reliability would incur. For instance, a tool or tester need not be perfect in appearance but it must have the same standard of safety or accuracy as new. Customers' apparatus, however, must look new.

Reliability of refurbished equipment is much more difficult to predict than with a newly-constructed batch of items that have the same origins. If it were possible to determine the number of operations, or number of hours in use of recovered equipment, it would be easier to predict the residual life and consequently the extent of refurbishment that should be undertaken, before returning the item to the shelf in the same category as new.

The best compromise is often taken by specifying renewal of components proven by statistical analysis to be a fault liability whether they are faulty or not. The philosophy here is that it is better to spend a few pence extra during overhaul, rather than risk premature maintenance visits in the field where loss of revenue, customer dissatisfaction and maintenance staff's time, would incur a much higher cost penalty. If the amount of refurbishment estimated makes the cost of repair greater than the cost of new, the item is generally made non-recoverable.

This form of repair or refurbishment, however, should not be confused with the

Area renovation centres employ more than 300 registered disabled staff throughout the country . . . Here at Camberwell, technician Ken Young tests a keypad on a 756 telephone. The equipment shown here can test all standard telephones including self-contained and multi-frequency (MF) keyphones.

servicing of faulty items. The refurbished item is destined to be sent to the field alongside new, whereas the serviced item is returned to the user and is expected to be of a somewhat lower standard.

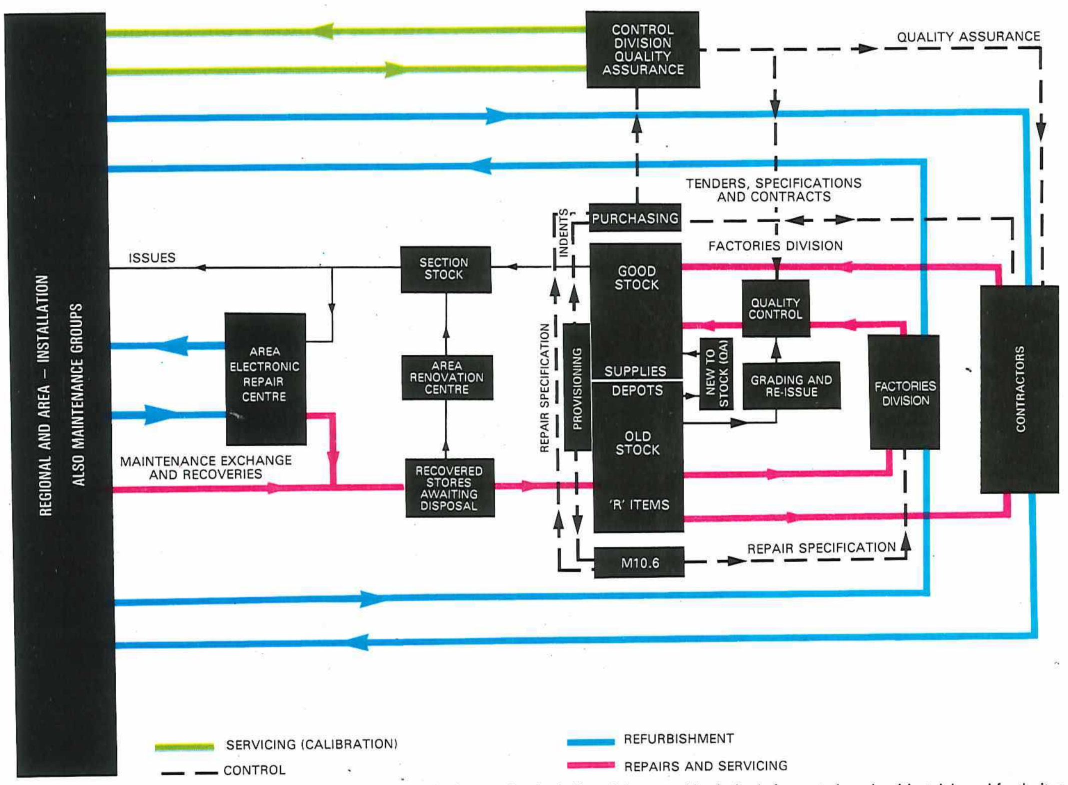
Several factors govern whether or not to recover equipment from the field for refurbishment. These include capital value considerations, potential recovery rate, true value and design. Items which cost below £15 for instance could not be refurbished economically unless very large quantities were returned on a regular basis as happens with 700-type telephones which are recovered each year at an asset value of about £18 million.

With potential recovery rate, a knowledge of where the item is used in the field, its estimated reliability and prospective population is required before a forecast of its recovery rate may be made. Failure to make an item 'R' at the outset could cause severe wastage if an unforeseen recovery rate materialised. Conversely, a small quantity of recovered items would occupy valuable storage space and be accounted as capital assets lying idle until sufficient numbers had been accumulated to justify the overheads of refurbishment. Correct interpretation of recovery data can provide a valuable indicator to the reliability of an item in the field.

But costs are not necessarily the governing factor in deciding whether to recover an item or not. A low capital cost item

Factory technician Dave Eade inspects a badly-packed PMBX 12 recently despatched to Crayford depot from a telephone area. Clearly visible are the slide-in units which should have been packed separately. Resultant damage from such carelessness costs British Telecom thousands of pounds yearly and often makes repair or refurbishment uneconomical.

RECOVERY & REPAIR OF STORES



Overall movement of stores recovered from the field for servicing or refurbishment. Repair of old stock is governed by the level of new stocks and anticipated demand for the item.

may hide its true value in that it may be a vital part in the working of a larger value item. A good example of this is the Indicator 3300B used as a supervisory signal in the cord circuits of 'doll's-eye' switchboards. This was designed by the National Telephone Company in the early part of the century, yet until the switchboard is phased out, repair of this low-cost item is vital to the maintenance of customer service.

Finally, design presents a problem in that more and more items today are made so that it is often impracticable to effect a repair. Value engineering by the manufacturer to reduce costs has made some equipment impossible to dismantle without destroying the item. This means that adjustments made during assembly and which require checking during refurbishment are inaccessible when the item is fully assembled.

And it can often be the case that economies originally planned by the purchase of proprietary items from different manufacturers on a competitive basis can be negated at the repair stage by the fact that all provisioning of spares must be from the original manufacturer on a non-competitive basis. Multiplicity of proprietary designs on the same item gives rise to an increase in the piece parts required, which is, of course, directly proportional to the number of manufacturers of the item.

Some equipment is catered for by servicing rather than an over-the-counter exchange for a replacement. Such an example would be a faulty teleprinter which could not be repaired at customer's premises but would be serviced at a workshop within an area or region.

Other more specialised equipment may be despatched to British Telecom factories on an urgent repair-and-return basis or to an area electronic repair centre.

The increasing complexity of electronic equipment, hazards of transport and handling of fragile printed circuit boards, and cost penalties of holding large pool stocks within materials depots, has led to an increase in direct field to area or factory workshop for repair. The economic argument for and against this form of servicing as against a centralised collection of all faulty items for a more streamlined factory repair process are complex and the decision to service or return via supplies depots is evaluated for each new item being introduced.

One exception to centralised refurbishment, has been the establishment of 93 area renovation centres employing in all about 340 staff – most of them registered disabled – to refurbish customers' apparatus within areas. The advantage to British Telecom is that customer apparatus (mainly telephones), removed from service in good working order, may be cosmetically cleaned up with replacement of a few minor parts and restored to service in another customer's premises within a comparatively short period.

At the London factory in Enfield, small manual switchboards are refurbished with the help of a special ultrasonic cleaning machine here being operated by factory technician Danny Pay.

To be able to refurbish a telephone in under a week makes good economic sense for the business as a whole, while at the same time providing work for staff who, whether by accident or ill-health, are incapable of carrying out their normal duties – particularly welcome in 1981, the Year of the Disabled.

Responsibility for technical and economic administration for the renovation centres rests with Material Services' Professional Services Division which provides guidance on refurbishment methods, layout of workshops, spare parts, economic targets and technical advice. By controlling the design and provisioning of telephone test equipment to the renovation centre, performance of the refurbished telephone is kept to specified standards, and plans are in hand to supersede present test equipment by a single microprocessor-controlled tester.

With the advent of the microchip, on-site repair is becoming more and more impractical. At present the standard 700-type telephone can be repaired at a customer's premises, as can the PABX, but integrated circuit technology presents the maintenance engineer with a situation which no longer enables him to repair on site. The keyphone and the customer digital switching system require expensive test equipment and software must be prepared by engineers to effect meaningful tests.

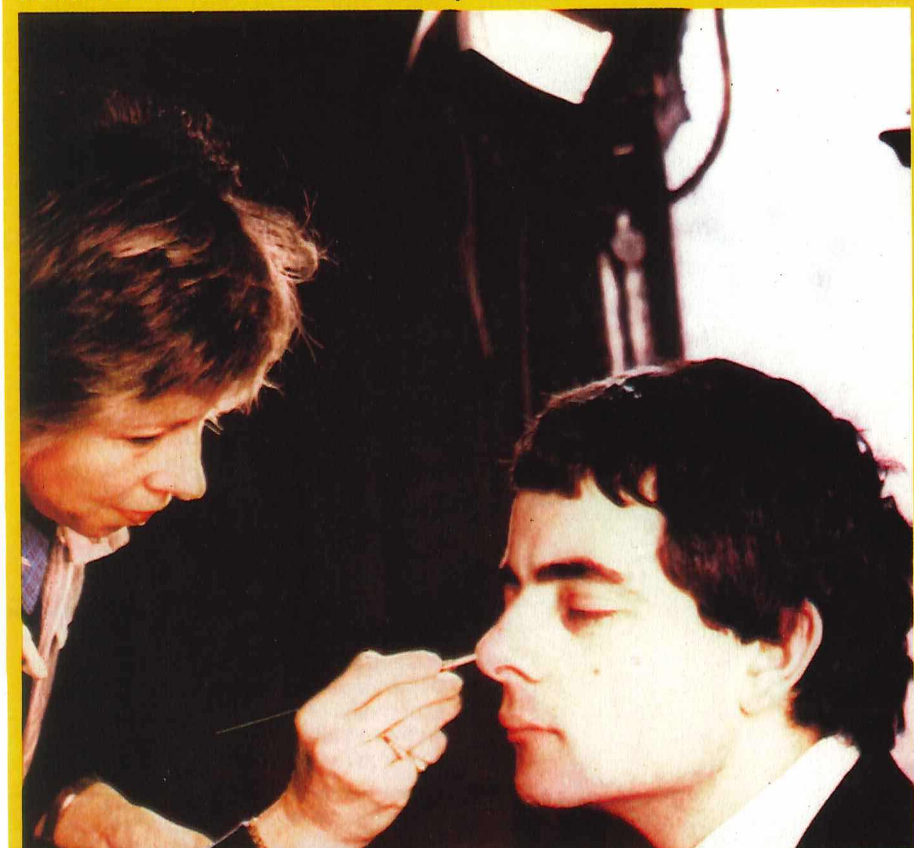
Recovery of fragile printed circuit boards (especially devices that are vulnerable to electrostatic damage from mishandling) via supplies depots for repair will become less economical than direct field to workshop and return, with its more closely controlled transport of the items. Technological advances are also likely to make equipment obsolete sooner than in the past where wear out was the deciding factor in replacement by new. The economics of refurbishment for a second life is likely to prove too attractive to abandon as more economies are required in the future, but the days of re-cycling customers' apparatus two, three and even four times before the end of their lives are disappearing fast.

Mr I. A. Niven is an executive engineer in Central Services Materials Department and is responsible for the economics of repair on equipment recovered into supplies depots and area renovation centres.

G K Mitchell A film fi

Rehearsing a scene from the film with Rowan Atkinson berating a colleague for not answering the phone.

Rowan Atkinson receives final make-up touches.



The need to go out and sell the wide range of equipment and services it offers has never been more important to British Telecom. Selling, however, can take many forms and one which has been used with considerable success by a variety of organisations in recent years is the short, humorous film with well known personalities such as John Cleese and Ronnie Barker taking starring roles.

British Telecom's first venture into this type of production began about a year ago and the result is now a very funny 20-minute film which uses *Not the Nine O'clock News* favourite Rowan Atkinson to help sell Monarch, British Telecom's all-electronic office telephone system.

The film – *Mr Kershaw's Dream System* – has already won this year's top prize in the British Industrial and Scientific Film Association's award ceremony held at Brighton. It first began taking shape when Queen's Award for Industry winners Video Arts Ltd were approached to write and produce something which would not only highlight some of Monarch's many advanced features but also use comedy to amuse an audience of potential customers. A meeting took place to discuss script ideas with Antony Jay (writer of BBC TV's *Yes Minister*), Rowan Atkinson – and the Video Arts production team. Many amusing ideas flowed at that meeting and within a few weeks a pilot script was submitted for British Telecom's approval. This was carefully vetted to check technical detail.

The film was to be about Robin Kershaw, played by Rowan Atkinson, who had been with his company for many years. In that time, the company had expanded and was using many more telephones. The problem was that the company had outgrown its old system and the resulting chaos had proved too much for Kershaw.

Explaining the problems to Dr Bowen his psychiatrist (played by Geoffrey Palmer of BBC TV's *Butterflies*), Kershaw is to be seen in a series of flashbacks suffering the chaotically funny, but very real, problems which he was experiencing using the antiquated system. Interspersed were scenes of a perfect system (the Monarch) which Kershaw thinks he is only dreaming about. At the end of the film Dr Bowen insists that Kershaw faces reality and the two of them visit the company to find that a Monarch really has been installed.

t for Monarchs

Thus Kershaw's sanity is restored.

Filming began just before Christmas at a flat near the Royal Albert Hall in London. The Video Arts team moved in with a vast array of film equipment and props and all was set to begin. Each scene had been carefully scheduled to make the best use of the time available, and representatives from the British Telecom Monarch product group were on hand throughout filming to advise on the telephonic aspects and make sure that the film followed exactly the Monarch's capabilities.

All of the scenes were filmed throughout a week-long period with a total of about 30 people busy looking after all the various aspects such as make up, wardrobe, lighting, sound recording, set decoration and so on. Even a firm of caterers had been brought in to provide endless tea and coffee and substantial quantities of hot food when needed.

The need to get everything just right was paramount and most scenes demanded several rehearsals. It took about an hour and a half to prepare, rehearse and shoot one sequence for instance which lasts only 16 seconds in the finished film. But although everyone worked extremely hard there were many lighter moments and by the end of the week the various sets had certainly seen their fair share of laughter.

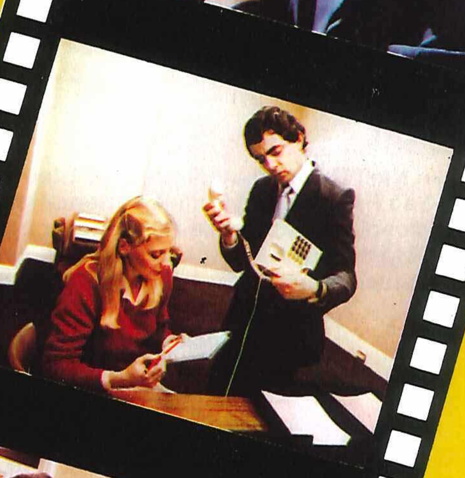
Next step was the editing process during which the individual scenes were linked together in the cutting room early this year. Parts of the sound track were dubbed on in a sound studio in the heart of Soho. Telephone bells and tones were added to the sound track as none of the telephones in the film, other than those on the Monarch System was actually connected. After four hours work the dubbing was complete, and the film finished.

The whole thing took several months to complete, was demanding work but the end result was a short, amusing film which is certain to repay the effort put into it by achieving its goal – to sell vast numbers of the Monarch Call Connect System.

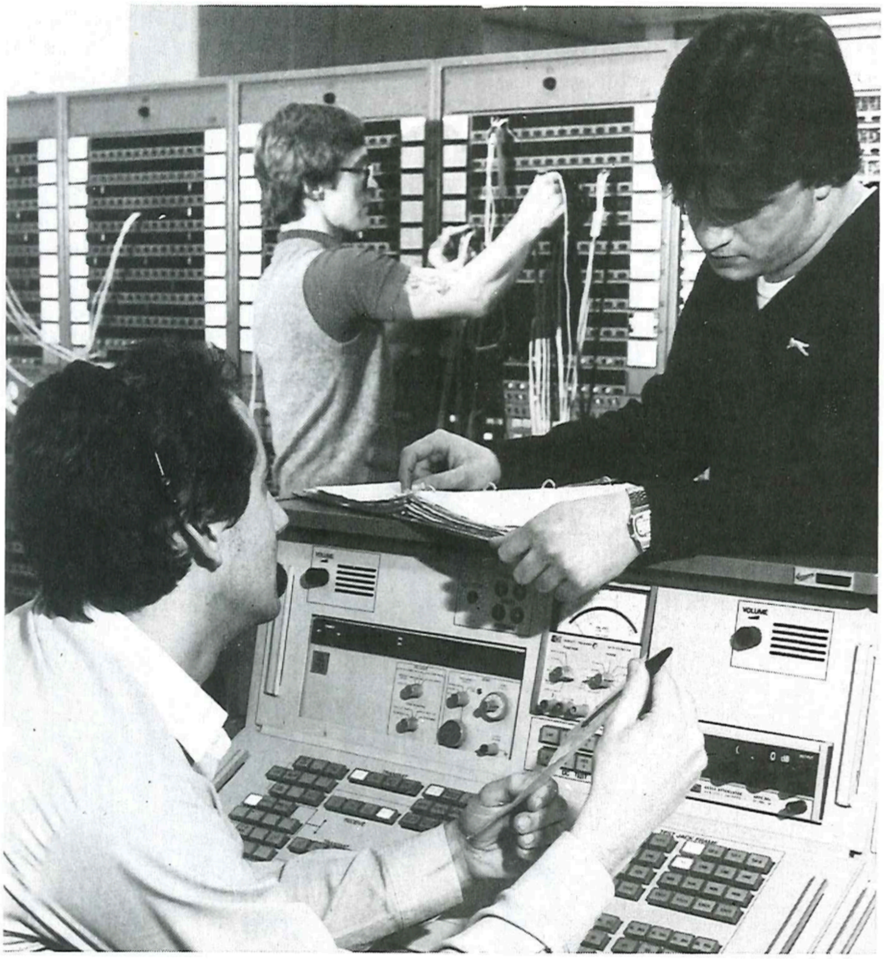
Mr G. K. Mitchell is a senior telecom superintendent in British Telecom Enterprises Monarch product group and is responsible for current developments of the Monarch Call Connect System.

British Telecom Journal, Summer 1982





Stills from the film: Kershaw tells Dr Bowen about his phone problems; after getting a crossed line, Kershaw shows his frustration by putting his boss in contact with the New York Samaritans; Kershaw discovers the Monarch system but thinks he is dreaming; Dr Bowen assures Kershaw that Monarch is real; Kershaw discovers the benefits of the Monarch system for himself.



Technician Neal Oxley (seated) tests an international leased circuit routed to Sao Paulo, Brazil from the international maintenance centre in London's Mondial House while Roger Deller (right), checks a circuit routing document. In the background, technician Mervyn Bronze patches another circuit to the test console ready for checking.

Lining-up international business

B J Hutt

The United Kingdom economy depends largely on international business – much of it using international private leased circuits. British Telecom International (BTI) must ensure that these links are of good quality and provided on time. But it is the after-sales service – the vital task of maintenance – which in the end determines long-term customer satisfaction.

By providing circuits on time and offering excellent maintenance support, BTI has been successful in attracting and retaining the hubs of the international networks of major companies in the face of competition from other countries. The added challenge of competition from within the UK resulting from the breakup of British Telecom's monopoly and the increasing service expectations of customers puts added emphasis on speed of provision and quality of maintenance.

Although much business is conducted via the international public switched networks, there are many situations where the customers need to transmit information accurately and on time. This is where international private leased circuits come in, particularly where customers need to send data at speeds which cannot be sustained by the public switched network, for example, for data processing purposes.

And for the customer, it may also be cheaper to rent a direct circuit where there is a high level of traffic to a particular location or where a saving in time can result in financial benefits, for example, in the money exchange market. Many of the larger companies operate private circuit networks which offer an efficient and economical service together with possibilities for maintaining service in the event of breakdowns.

With 3,000 commercial international private leased circuits, about 70 per cent of which terminate in London, the UK ranks as a leading provider and user. This means very significant benefits, not only in terms of revenue earned by BTI, but also in maintaining London as a major centre for business communications.

International private leased circuits currently in use fall into three categories:

- Voice grade circuits for services like speech, data at speeds up to 9,600 bit/s, telegraphy, phototelegraphy and facsimile.
- Wideband circuits (48 kHz group paths) for data at 50/56 kbit/s.
- Sound and television circuits for broadcasting authorities (although these have not been considered here).

These private circuits can carry speech via customers' private exchanges, data between computer terminals, telegraph-type messages or a combination of these. The types of service to be carried determine the transmission properties or characteristics required of the circuit and, in most cases, are specified by the international telegraph and telephone consultative committee (CCITT) which ensures that countries install, operate and maintain these circuits to common standards and procedures.

The many different types of circuit and services require a high standard of technical expertise and a correspondingly wide range of test equipment. Customers will of course try to get the maximum use from their circuits by transmitting as much data as possible in a given time. This imposes severe requirements on the circuit and although in most cases BTI does not offer a guaranteed transmission rate, customers' expectations are usually met.

The success of a company's international business depends on the reliability and availability of its private circuits. Maintenance undertaken by BTI aims to ensure that the service given to the customer is what the customer wants. Unlike national private leased circuits which are wholly under the

control of British Telecom, no single authority has direct responsibility for an international private leased circuit. The task is shared by the authorities in each country responsible for international services. Clearly, the closest of international co-operation is required to ensure satisfactory service, and this is based on CCITT maintenance procedures which are specified in such a way that they may be applied whatever the maintenance organisations of the countries concerned. BTI's long experience in international communications means that it can take a leading part in directing and controlling this international co-operation – resulting in good service for customers.

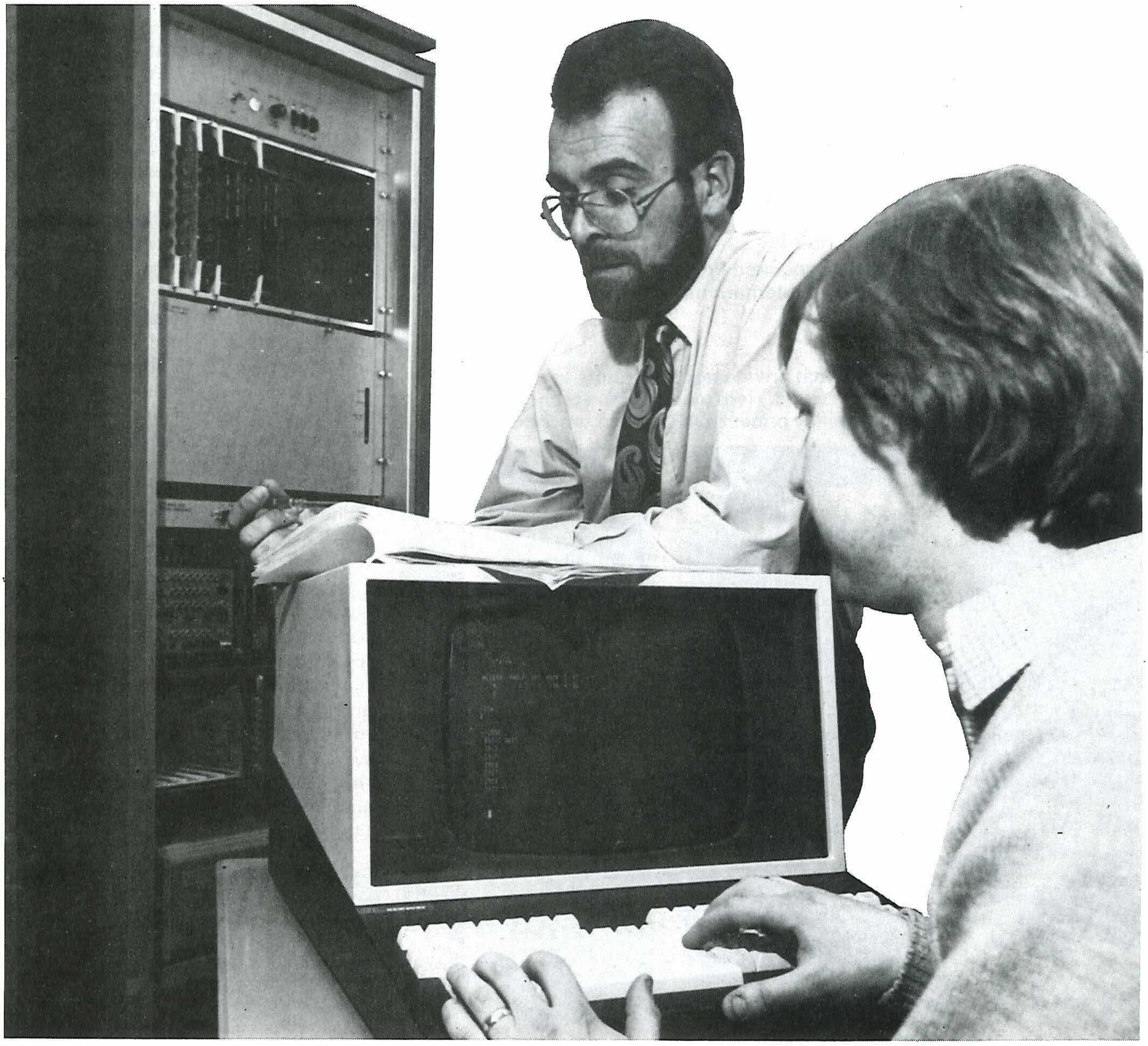
Each London international maintenance centre (IMC) has overall maintenance responsibility for the international private leased circuits routed through it. IMC staff work with their counterparts in other countries as well as with area maintenance staff throughout the UK to check-out and find faults reported by the customer.

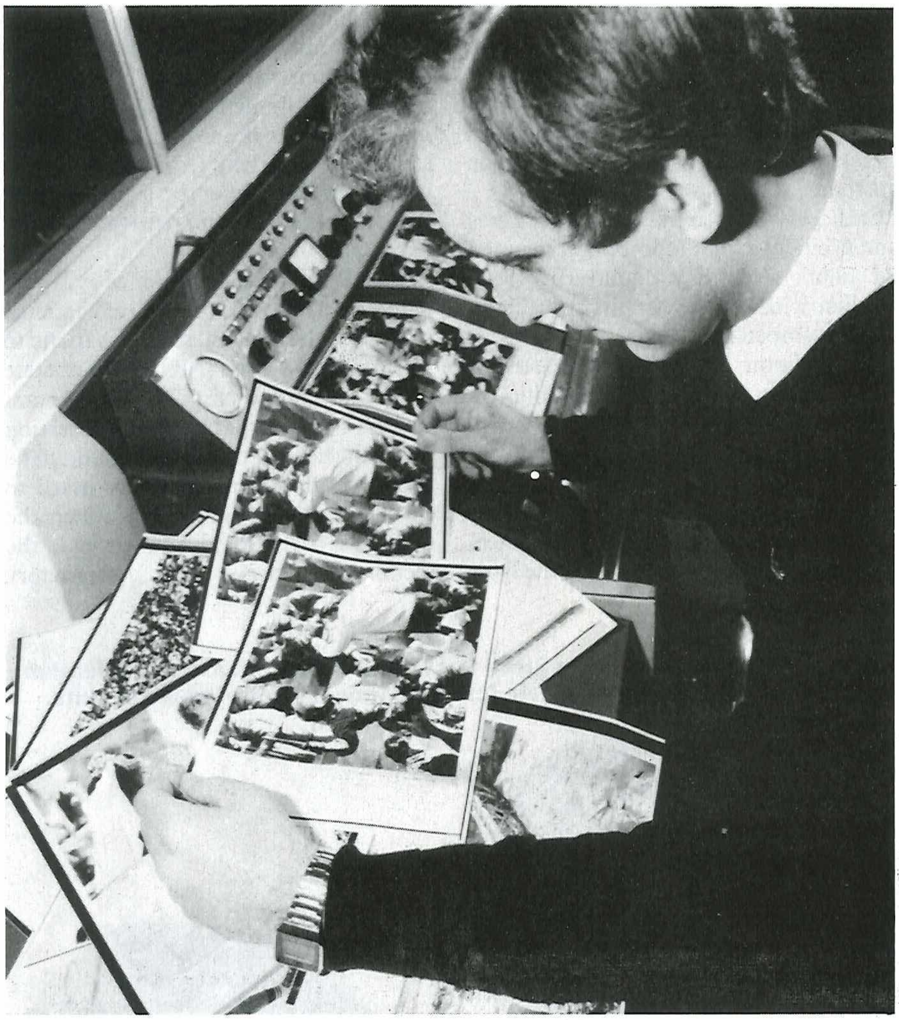
Each IMC has circuit testing facilities and provides a fault report point manned 24 hours a day by engineering staff familiar with private circuits and able to deal competently with customers. During normal working hours, private circuit maintenance is carried out by specialist engineers. At other times coverage is given by staff maintaining both private circuits and international public switched circuits.

When a fault is reported by a customer, the first steps are to confirm that the fault exists and, if so, where the fault has arisen. It may be between the IMC and the UK customer, or even on the terminal equipment at the customer's premises. Often the customer can help by sending or receiving test signals or even to loop the line so that test signals may be sent from the IMC and received back for checking.

Fault location and clearance will also involve maintenance staff at national centres. If the national section is found to be clear, the London IMC will co-operate with its counterpart in the distant country to check the international section between them. If this is then found to be fault free, the distant centre is asked to check its own national end. When the fault has been found and cleared, the section is tested for satisfactory

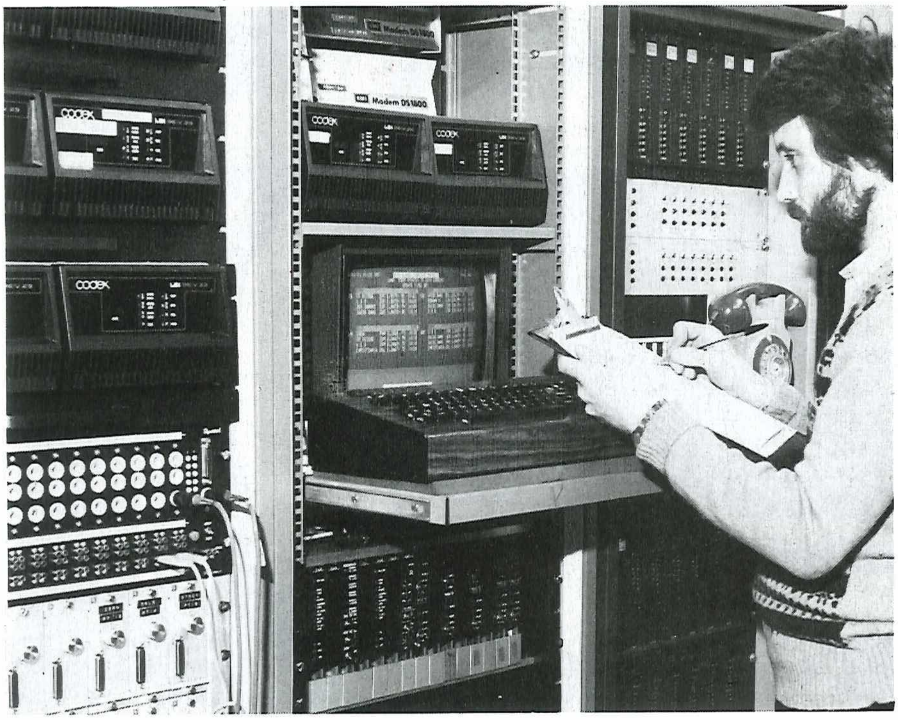
Assistant executive engineer Peter Scriviner (standing) and technician Steve Dasykowski carry out a local evaluation of remote access test equipment which may be used as a maintenance aid for international private leased circuits.





Allan Page, traffic controller at Associated Press in London, checks quality of wirephotos sent from Rome over international private leased circuits.

Associated Press uses international private leased circuits to relay financial information around the world. Here maintenance technician Steve Moyes monitors spot currency prices in AP's communications centre.



performance and the circuit offered back to the customer.

This procedure is intended to restore circuits to service as quickly as possible as it can often take a long time to get a response from a distant international maintenance centre. Staff at these centres are not always available, and although UK IMCs have linguists in the three recognised international languages – English, French and German – the same is not always true of centres in other countries.

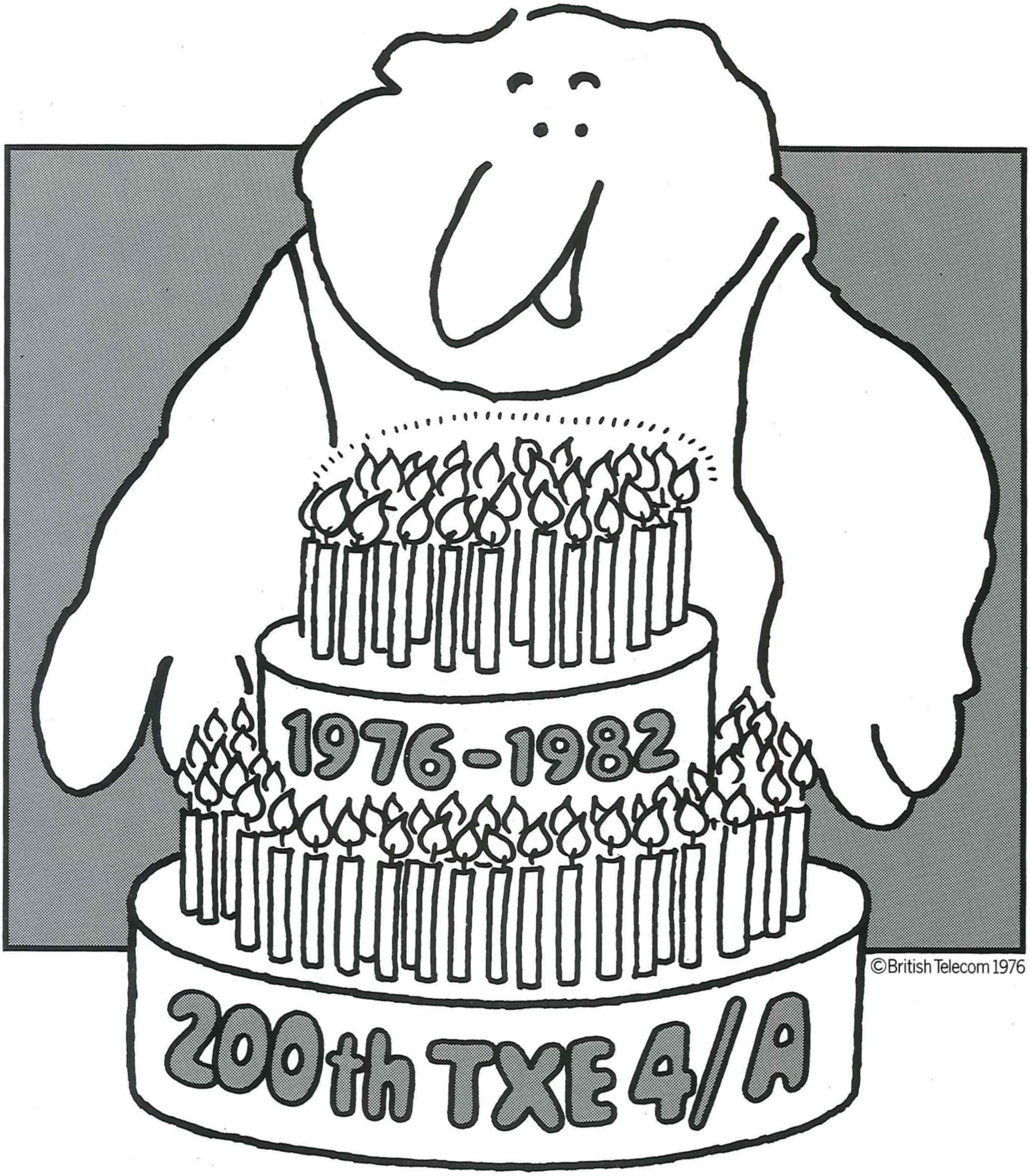
New facilities currently being considered include automatic circuit loop-back equipment which is fitted at the interface between the line and the customer's equipment and is remotely controlled by signals from the IMC. Already used in North America, they are now being evaluated for UK national private circuits.

Another recent BTI move has been to appoint a special service manager, an engineer to be responsible for the overall co-ordination of all international private leased circuit maintenance activities at area level within BTI. Any problems or difficulties that cannot be resolved normally will be his responsibility.

Consideration is also being given to co-ordinating international private leased circuit maintenance in a centre (or centres) to be known as the international special service co-ordination centre (ISSCC). This would provide a single fault report point to serve all its customers and its comprehensive test facilities would include remote access test equipment (Rate) to gain access to all international private circuits at associated international repeater stations. The concept of the ISSCC and use of Rate is in line with similar moves being considered nationally.

The most important benefit from the ISSCC would be that the single fault report point and use of Rate would allow a faster and more effective response to customers. It would also allow the particular expertise needed for maintaining international private circuits to be brought together rather than be deployed among a number of IMCs as well as help to improve 24-hour coverage. And the service will be further improved when the special service co-ordination centres and Rate become fully operational in the UK national network.

Mr B. J. Hutt is head of group in British Telecom International responsible for international private leased circuit maintenance.


1976-1982
200th TXE 4/A
©British Telecom 1976

MISCELLANY

More phones for sale

British Telecom has now freed all 20 or so of the telephones in its Special Range for sale in high street shops in a further effort to help the Government's liberalisation programme.

The firms who supply British Telecom may now offer the same equipment direct to specialist retailers and department stores for sale to the public. Suppliers will also be able to offer British Telecom's standard range as well – the familiar 700 series previously available only on rental.

British Telecom is also launching two new sales initiatives – one by direct mail, the other through larger branches of Boots. Customers in the Portsmouth, Chichester, Maidstone and Canterbury areas received brochures offering them the chance of buying their own British Telecom guaranteed extension phones. In addition, mail offers are being sent to customers in Taunton and Carlisle who took part in the marketing trial last year of the new plugs and sockets.

The deal between British Telecom and Boots means that larger branches of the chemist's chain will stock a wide selection of telephones. Over-the-counter selling at Boots augments the growing number of phoneshops set up by British Telecom within department stores around Britain.

Spiritual connections

The recent pastoral visit of Pope John Paul II – taking in nine cities and 40 locations – involved British Telecom in its largest-ever single operation, providing communications facilities at all the events.

More than 29,000 extra manhours were spent on providing facilities for the visit and 50 kilometres of temporary cable were installed at sites around the country enabling broadcasters to send sound and pictures for radio and television transmission throughout the world via the London Telecom Tower.

Contracts

Newbury Data Recording – £1.4 million for the supply of nearly 1,700 asynchronous VDU and matrix printer terminals. British Telecom will use some of the terminals with the new SwitchStream packet switching service. The rest will be linked to both mainframe and small business computers for a variety of applications.

CASE – £600,000 for the supply and installation of outgoing line concentrators and telex interface for the public Telemessage and international telegram services run by British Telecom International.

Marconi Communications Systems – £11 million for 30-channel pulse code modulation equipment and regenerators. PCM is ideally suited to use with KiloStream, British Telecom's new digital leased line service.

Standard Telephone and Cables – An order for the design and manufacture of 500,000 new electronic pushbutton telephones. Production of the new phone has begun at STC's Monkstown factory in Northern Ireland.

World Cup links

British Telecom played a leading role in helping the nation's media cover the World Cup in Spain during June and July.

Sound and vision circuits were provided for both BBC and independent television to enable them to bring live coverage into the sitting rooms of millions of viewers and listeners throughout the country.

Television coverage was transmitted to the UK via a satellite in orbit 22,300 miles above the equator. Signals from the satellite were picked up at Goonhilly and passed to the London Telecom Tower where they were distributed to the television broadcasters.

Competitive network

Britain's long-distance networks are to be run by a new profit-accountable business unit operating within British Telecom.

Known as National Network Services (NNS), the unit will manage and operate the public trunk telephone service, data and telex services, the X-Stream family of digital services and long-distance private circuit networks. It will be part of British Telecom's Inland Division and will comprise two departments – Trunk Services, running the public trunk telephone network and Specialised Services, responsible for the telex network, the packet switching network and the X-Stream digital and data services, and for long-haul private circuit networks.

NNS is the first step in reshaping the Inland Division towards facing future competition. Its chief executive is Ron Back, previously senior director, Network.

Body lift

Savings of £1½ million a year are expected from the introduction of a new lift-off body for British Telecom's 20,000 15 cwt telephone vans.

Designed by British Telecom's motor transport division, the lightweight plastic bodies are virtually rustproof and can be lifted quickly and easily from one chassis to another. Their use can cut down driver's time spent in service depots from six hours to a few minutes.

The bodies are made from glass reinforced plastic panels with a foam sandwich insert, plywood floor and translucent plastic roof. They are designed to be lighter, roomier and easier to use than integral panel vans.

Eurodata Yearbook

The 1982 edition of the Eurodata Foundation Yearbook is now available. The comprehensive information, provided by the 18 European members of the Foundation is laid out in eight sections for each country.

The Yearbook is on offer within British Telecom at £70. An update of the tariff section will be issued in October at £10 to British Telecom purchasers. All requests with a local order, should be sent to: Miss F Delhaye, The Eurodata Foundation, Broad Street House, 55 Old Broad Street, London EC2M 1RX.

On the button

A new electronic phone offering a wide range of special features at the touch of a button, is now available from British Telecom.

Called the SL-1 Featurephone, it has been designed to exploit the facilities provided by a particular model of private office switchboard, the SL-1 digital electronic PABX, a proprietary large PABX supplied by Reliance Systems, a GEC company.

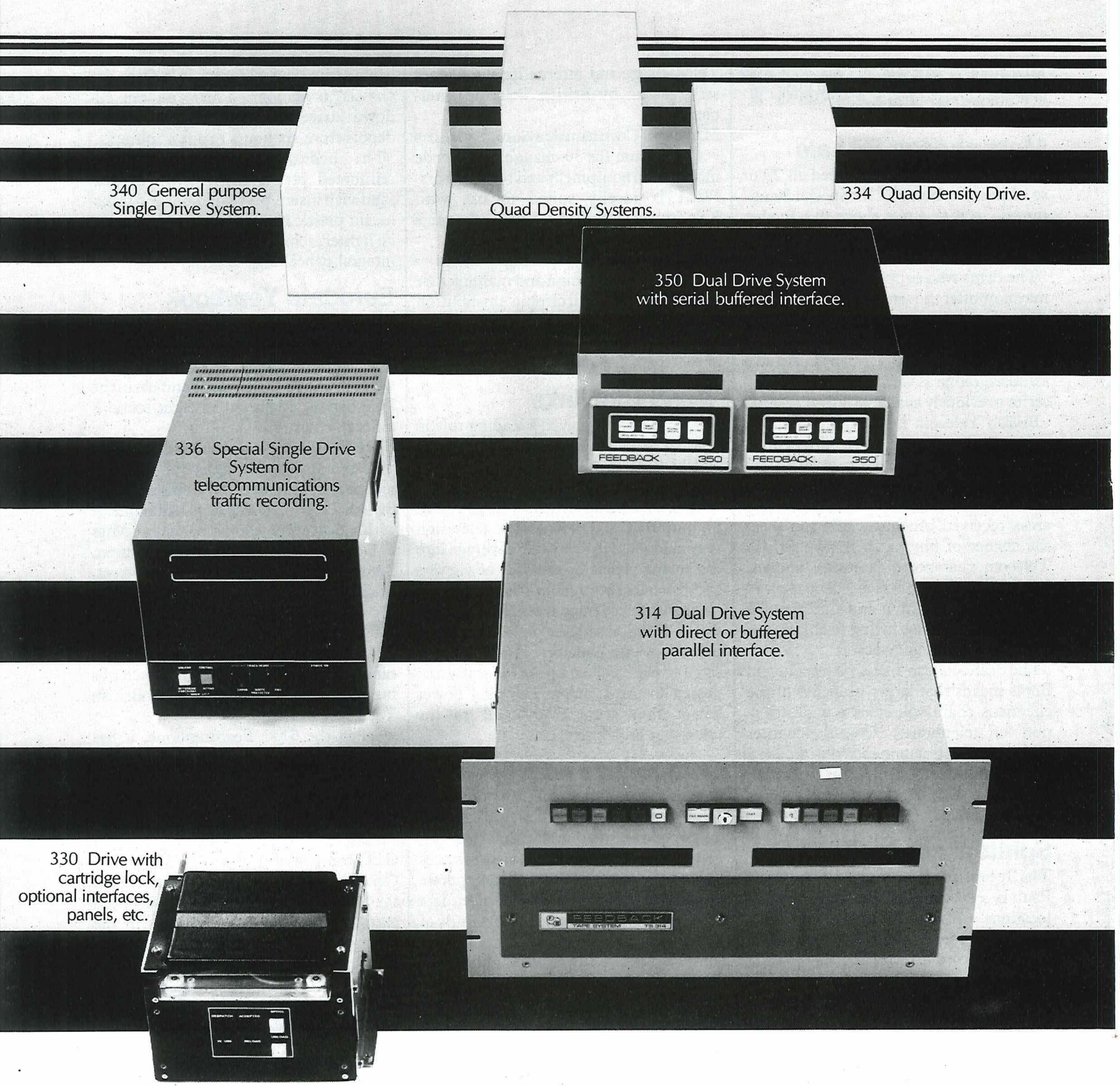
In addition to the usual 12 pressbuttons, the SL-1 Featurephone has a row of ten extra buttons which give access to the features of the PABX. These include auto dialling, code calling, a charge account for cost call analysis, repeat calling, conference calls, call diversion, hold for enquiry and three-party calls.

Touch screen orders

Orders worth more than £1¼ million are now being processed by British Telecom for its unique 'touch-screen' communications system for dealers and brokers launched in the City of London.

This City Business System – the first of its kind in the world – features a television screen which doubles as a data display and touch keyboard. Telephone calls can be set up simply by touching the screen.

The equipment has been designed to combine two specialised communications requirements of the City's international currency and commodity dealers – a flexible multi-line communications unit giving instant access to private circuits, exchange lines and



THE WAY AHEAD FOR TAPE CARTRIDGE USERS

The Feedback Data 330 Drive has established itself as the standard amongst discriminating users such as the telecommunications industry who demand efficient and reliable operation.

To the widely-used 314 dual-drive, parallel interface systems and the special purpose units such as the 336 traffic recorder we have recently added the 350 system. The micro-processer controlled, dual-drive 350 system with twin serial communications interfaces can be used as a simple data dumping and retrieval device for data logging. Alternatively, via a comprehensive instruction set it can operate as a fully controlled peripheral unit.

Next in line, to be announced shortly, will be the 340 single drive system with a range of optional parallel or serial interfaces followed by the 334 high density drive and high density systems.

Feedback

PSA PERIPHERAL SUPPLIERS ASSOCIATION

Feedback Data Limited
Uckfield, E. Sussex TN22 1PT
Tel: Uckfield (0825) 4222. Telex: 95607.

private switchboards and a compact display terminal for calling up computerised information.

All change in kiosks

Computers are helping to clear coins more quickly from London's public payphone kiosks. A new system called 'All Change' enables coinboxes to be cleared as often as six times a day, seven days a week.

Jammed, dirty or damaged payphones and coinboxes are reported by All Change which monitors London's 10,800 kiosks as well as counting the coins collected from them – usually amounting to about £380,000 a week.

'All Change', installed in a West London Telecom building, will save about three million pounds a year. Under the old system about 400 London kiosks a day were out of order because of overfull coinboxes. This number will now be substantially reduced.

CS Iris on duty

Fifty British Telecom International staff were aboard the cableship *Iris* as she sailed into the South Atlantic to join the Falklands Task Force in June.

CS Iris was requisitioned by the Ministry of Defence and within three days the 3,873 ton vessel was transformed from a domestic cableship into one capable of accommodating Sea King helicopters.

The ship's main duty was to carry small batches of stores around the Task Force.

● During the Falklands crisis, British Telecom set up a freefone casualty enquiry service for use by relatives of servicemen.

Exchange 200

Standard Telephones and Cables (STC) formally handed over its two-hundredth TXE4 exchange to British Telecom in June at Milton Keynes, Bucks.

Subscriptions and back numbers:
The price to staff at their point of work is 30p a copy.
To subscribe, please complete the form below. The life subscription for retired staff is £9.50
For readers outside, the two-yearly postal subscription is £8 (US$16). Air mail rate to all zones is £20 (US$40)
Back numbers are available from July 1971 onwards at £1 each including packaging and postage.

Remittances:
Please make Cheques/Postal Orders payable to 'British Telecom', crossed '& Co'. For Giro transfers, our account number is 513 8418; please send such transfers, and all correspondence to 'Business Manager' – address below.

Advertisements:
Communications should be addressed to:
Mrs Sheila Underwood, Litharne Ltd, Forge House, Bell Lane, Brightwell-cum-Sotwell, Wallingford, Oxon OX10 0QD.
Telephone: Wallingford (0491) 39370/35448.
Advertising copy should be addressed to Lorraine Leigh, Alabaster Passmore and Sons Ltd., Tovil Printing Works, Maidstone, Kent ME15 6XA.
No official responsibility is accepted for any of the private or trade advertisements included in this publication.

Advertising rates:
Rates: black and while full page £590; half-page (horizontal) £345, 1/4 page (horizontal) £205. Extra charges for full colour, prominent position, and bleed advertisements. There is a discount for series bookings (four issues).

Contributions:
The Editorial Board will be glad to consider articles of general interest in the telecommunications field from all sources. No gaurantee of publication can be given. The ideal length of such articles is between 1,000 and 1,500 words. The views of the contributors are not necessarily those of the Board.

Correspondence:
Communications should be addressed to the Editor, British Telecom Journal, Public Relations Department, 85 Watling St., London EC4M 9BN.
Telephone: 01-236 6662 (editorial) 01-357 2930 (sales).

Publication:
British Telecom Journal is published in February, May, August and November.

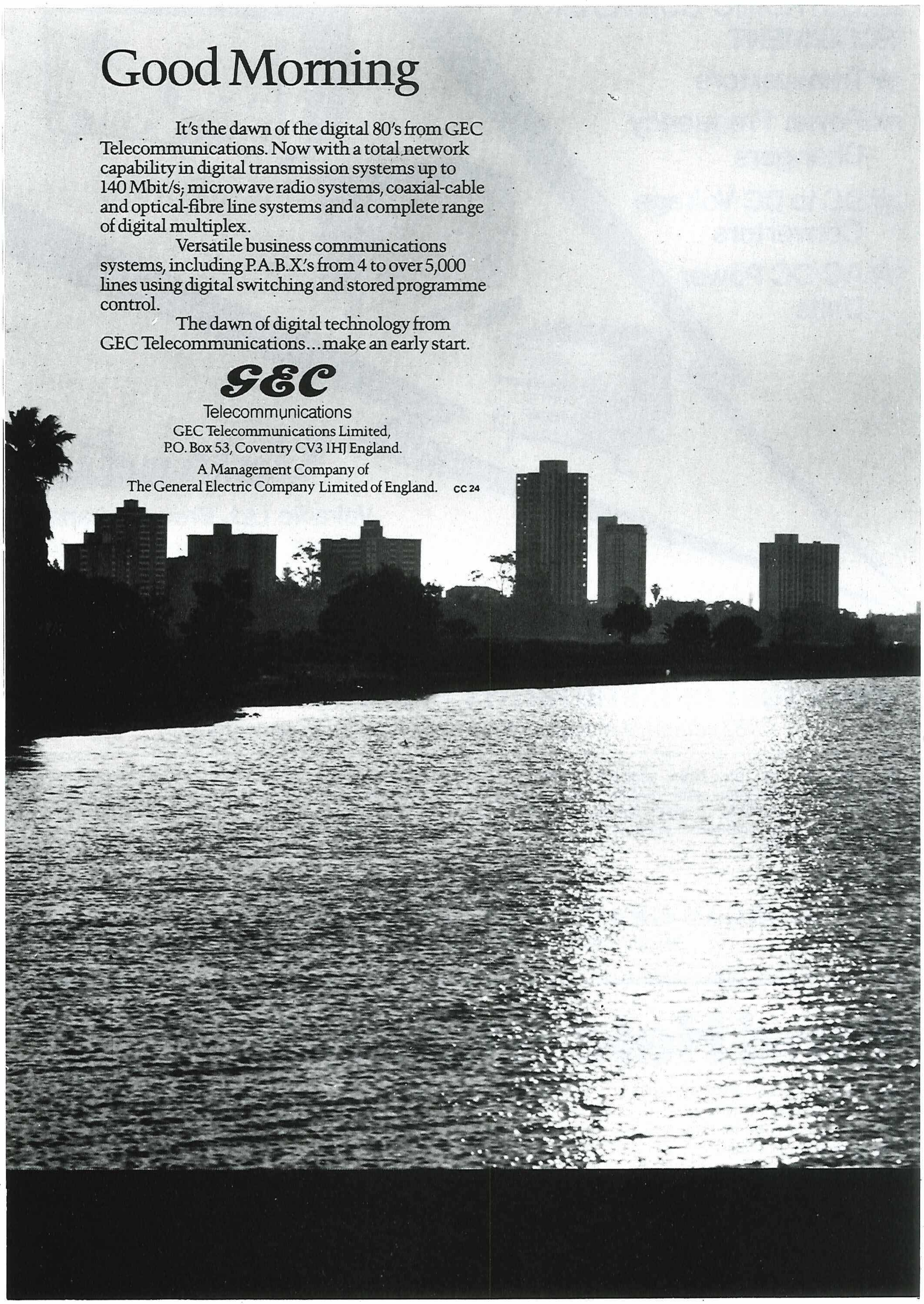
Registered International Standard Serial Number ISSN 0260-1532.

Phones as good as new at prices that make them as good as sold.

Because British Telecom are extensively modernising their network, Teletrade are able to offer you the whole range of unused or completely remanufactured telecommunication equipment at prices that make them hard to turn down.

For more details contact Dennis Holmes. 55 Old Broad Street, London EC2M 1RX. Tel: 01-588 5872 (Outside UK: +441 588 5872) Telex: 887523.

British Telecom
Teletrade


Good Morning
It's the dawn of the digital 80's from GEC Telecommunications. Now with a total network capability in digital transmission systems up to 140 Mbit/s; microwave radio systems, coaxial-cable and optical-fibre line systems and a complete range of digital multiplex.
Versatile business communications systems, including P.A.B.X.'s from 4 to over 5,000 lines using digital switching and stored programme control.
The dawn of digital technology from GEC Telecommunications...make an early start.
GEC
Telecommunications
GEC Telecommunications Limited,
P.O. Box 53, Coventry CV3 1HJ England.
A Management Company of
The General Electric Company Limited of England.
CC 24

LATHAM

Suppliers to
British Telecom of
specialised metal
components

Metal parts only
or complete component kit
including plastic items
and number wheels for message register

Exporters to the Worlds Telecommunications Industry

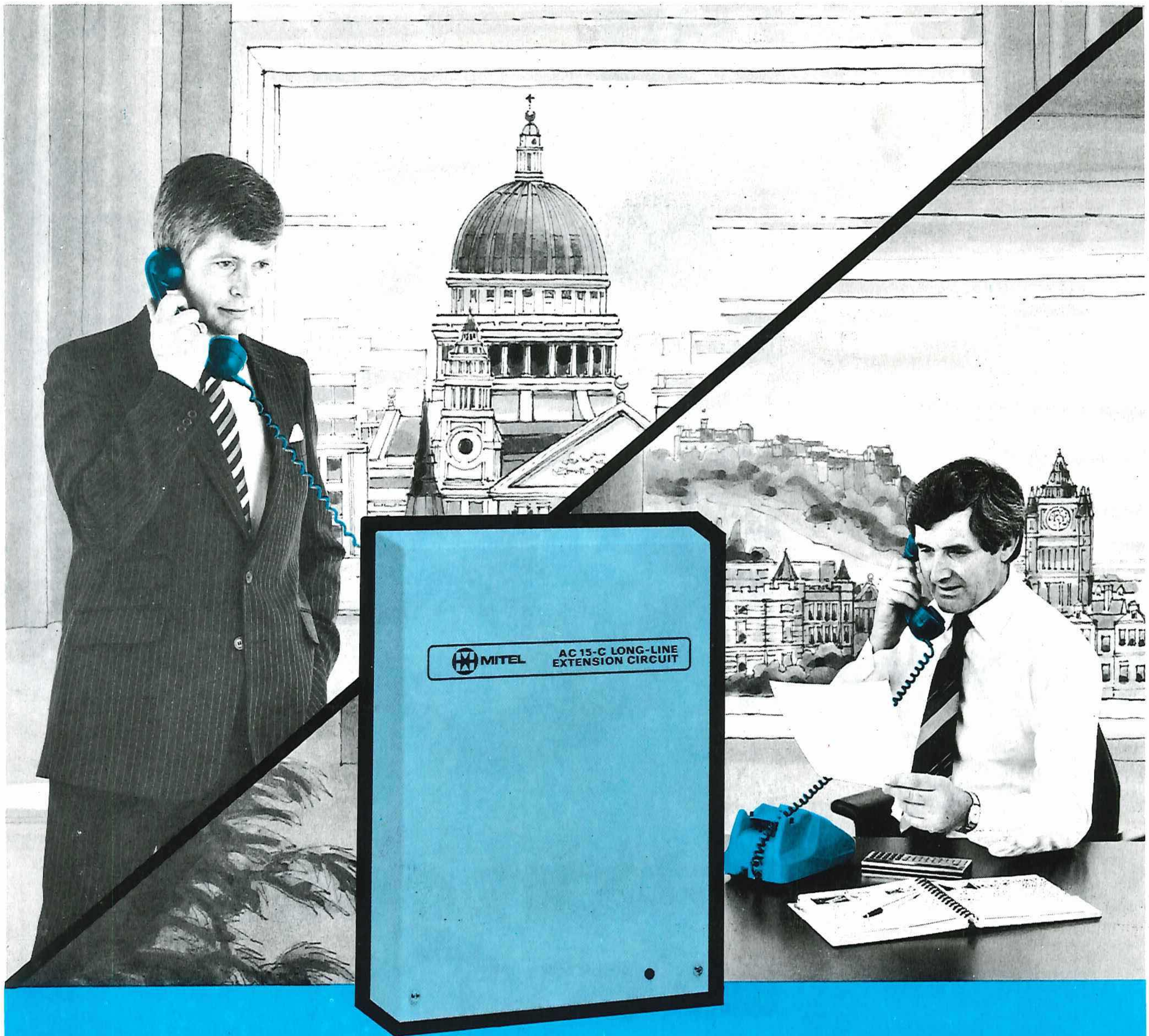
LATHAM MANUFACTURING CO. LTD.

Alma Street, Wolverhampton WV10 0EY England
Tel: Wolverhampton (0902) 56250 Telex: 339496 (UMEC-G)

TOPPER CASES

Topper Cases Ltd, St Peter's Hill, Huntingdon, Cambs., England. PE 18 7ET tel (0480) 57251 telex 32389

Ex stock or Made to Measure ~ Contact Ray Brackley or Peter Jeffery



MITEL BRINGS LONG RANGE COMMUNICATION WITHIN REACH.

With the Mitel Long-Line Extension Circuit, your PABX facility can be extended to any distant location. Your London Office can enjoy the same switchboard facilities as your Edinburgh Office.

- ☐ Up to 2 remote extension circuits over any distance.
- ☐ All extensions—local and remote—enjoy the same PABX facilities.
- ☐ Can be used with rotary dial or push-button telephones.

The LLE is compatible with ALL types of PABX extension units, and is ideally suited for the needs of Public Utilities, Large Retail Groups and Governmental Institutions. A 4-wire amplified private speech circuit ensures clarity and is all that is required between sites.

For full details contact

MITEL

Mitel Telecom Limited, FREEPOST,
33-37 Queen Street, Maidenhead,
Berkshire SL6 1BH.
Tel: Maidenhead (0628) 72821.

DAL 9970

British Telecom Journal is printed by Alabaster Passmore & Sons Ltd, London and Maidstone, and is published quarterly in February, May, August and November by British Telecommunications.

More accurate than William Tell. Faster than his overture.

THE NEW MARCONI 2830 MULTIPLEX TESTER

When you test PCM primary multiplexes you need high accuracy, fast speed and more than a little flexibility.

Which are the exact qualities that put the Marconi Instruments 2830 PCM Multiplex Tester head and shoulders above the competition.

The 2830 is a simple to operate unit providing a wide range of test functions including frequency response, gain, linearity, quantizing distortion, idle channel noise and crosstalk.

When combined with Channel Access Switch 2831, the capabilities of the 2830 are extended to provide readings of impedance balance, return loss and signalling distortion.

The 2830 can handle four programmable automatic test sequences as determined by the user. They can even be repeatedly recycled.

Although intended for use as a stand-alone unit for A/A measurements (it needs no external controller) in either automatic or manual modes, the 2830 Multiplex Tester can also be used in conjunction with Marconi Channel Access Switches, Digital Simulators and Digital Analysers to provide a complete test set in D/A and A/D applications.

Other features include:

* Automatic calibration function
* Level measurement accuracy of ± 0.025 dB at 850 Hz from +20 to −60dBm. Speed approximately 2.5 readings per second.
* Quantizing distortion measurement accuracy of ± 0.2 dB over 0 to 40 dB measurement range.
* Results may be printed out under GPIB control.

The 2830 PCM Multiplex Tester from Marconi. Check it out today.

marconi instruments

U.K.: Longacres, St. Albans, Herts AL4 0JN (0727) 59292. TELEX 23350
FRANCE: (1) 687-36-25 GERMANY (089) 845085